



Course Syllabus Version 1.0

**PHY 1038: Physics of Energy, Climate Change and the Environment
Fall 2018**

Class Meets Face-to-Face: Tuesday, Thursday 9:00 - 10:20 AM, HPA1 125

Professor: Dr. Josh Colwell
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Office hours: To be announced

Website: Class notes, grades, and announcements will be made on Webcourses.

Course Description:

What is this course? Arguably no issue facing our society and our planet is more critical than the growing need for energy to sustain healthy, comfortable and prosperous lives for the global population and the effects of that energy production and consumption on the planetary environment. This course tackles the hard quantitative facts about energy production and consumption and the interaction of those activities with the environment and climate. Tackling these questions requires a basic understanding of several fundamental areas of physics. In this course we will survey introductory physical sciences to develop the skills and scientific and quantitative literacy necessary to understand the interconnected problems of energy, the environment, and climate change.

Energy touches every part of our lives, from the mundane tasks of turning on a light, filling a car with gas, and paying a utility bill to the societal, climatic, and political implications of pollution, resource depletion, and greenhouse gas emissions. This

course will establish a fundamental literacy in the physics of energy in its various forms. From that foundation we will explore the implications and trade-offs involved in various energy use strategies. This course will provide the necessary scientific literacy to understand the fundamental issues surrounding energy and make informed decisions about energy production and usage.

Textbooks:

We will use two textbooks. One book provides the nuts and bolts foundations of the basic physical principles as well as a more detailed quantitative treatment of various types of energy and environmental impacts. Some homework assignments will be taken from problems in that book. It is:

- Energy, Environment and Climate, 3rd Ed. By Richard Wolfson

The other book provides a roadmap for analyzing energy needs and sources using simple calculations. It is:

- *Sustainable Energy – Without the Hot Air*, by David J. C. MacKay.

This book can be downloaded as a PDF for **free** from www.withouthotair.com.

It is also available in HTML for free here: www.withouthotair.com/Contents.html#TABLE

A print version is available on Amazon or other links at www.withouthotair.com.

We will use an interactive classroom response system (like the iClicker). This will make use of your own WiFi-enabled device such as a smartphone, tablet or laptop computer.

Student Learning Outcomes:

When you finish this course you should be able to:

1. Find and evaluate quantitative information relating to energy production and consumption.
2. Find and evaluate quantitative information about the evolution of the climate.
3. Find and evaluate quantitative information about the environmental impacts of energy production and consumption.
4. Solve problems and understand the consequences of the principle of conservation of energy.
5. Apply the work-energy theorem and the principle of conservation of energy to problems involving the transformation of energy and external forces acting on objects.
6. Solve problems involving transformation of energy between kinetic energy, gravitational potential energy, radiative energy, nuclear potential energy, electrical potential energy, and chemical potential energy.
7. Solve problems and understand the consequences of thermal emission spectra.
8. Understand the principles of emission and absorption spectra and how they apply to Earth's climate and atmospheric heating of the Earth.
9. Understand how the greenhouse effect works.
10. Calculate and evaluate the energy potential from different forms of energy production including wind, solar, fossil fuels, hydroelectric, tidal, nuclear, biomass, and geothermal.

11. Understand the broad characteristics of the global climate including global atmospheric and oceanic circulation and long and short-term planetary effects including seasons.
12. Understand the concept of a scientific model and evaluate the efficacy and accuracy of scientific models based on analysis of observations and model outputs.
13. Synthesize the basic physical principles and environmental impacts with analysis of real-world energy needs, uses, and distribution.

Enrollment Requirements: This course has no prerequisites.

Course Activities:

Required course materials and reading: Students should have both of the required textbooks listed above. *Sustainable Energy* can be obtained in electronic format for free. A printed copy of this book is not required. There will be required reading from both books as well as from additional sources provided to the class throughout the semester. In-class activities will include graded “clicker” questions using an electronic response system like an iClicker. This will use an internet-based system requiring a smartphone or other WiFi-enabled device in class each day. Exams will include multiple choice questions to be completed on scantron forms. Students provide their own scantrons. A simple calculator will be needed for some homework, quiz, in-class clicker questions, and exam problems.

Questions in class:

I favor an interactive classroom environment. Be prepared to ask and answer questions. Time permitting, I will answer your questions in class. There will also be a mechanism for you to send in questions by text message during class if you are uncomfortable asking it aloud (see number for texting at top of syllabus). If you are confused about a topic or would like to follow-up, please come to office hours or make an appointment for another time.

Lectures:

Lectures will include slide presentations, example problems, interactive clicker questions and discussions, and some demonstrations. Some worksheets may be used in class in conjunction with clicker questions. Notes and material presented in class will be scanned and made available on WebCourses. The reading assignments in the schedule below are to be completed before class on the day listed. The design of the classes will assume that you have completed the reading assignment.

Assignments:

First Assignment: Syllabus Quiz on WebCourses.

All faculty members are required to document students' academic activity at the beginning of each course. In order to document that you began this course, please complete the Syllabus Quiz Assignment on Webcourses@UCF (Canvas) by the end of

the first week of classes, or as soon as possible after adding the course. Failure to do so will result in a delay in the disbursement of your financial aid. This is a graded assignment in the category of “Webcourses Quizzes”.

Second Assignment: Meet Josh.

Your learning experience will be more effective if I know you and if you feel comfortable coming to my office hours for help. To establish a line of communication, I’m assigning each of you to have an individual meeting with me during the first two weeks of the course. These meetings will be only 5 minutes long, but this *is* an assignment, and your attendance will be scored as a 100/100 on the assignment. This assignment will be graded in the category of “Webcourses Quizzes”. Do it. A web-based sign-up system will be made available to you by the start of the semester for you to choose the 15-minute interval during which we will meet in my office.

Webcourses Quizzes: In addition to the first two assignments listed above, there will be about 6-8 online timed quizzes delivered on Webcourses with a nominal duration of 30 minutes or less. The questions on these quizzes will be similar to in-class clicker questions (see below) and short homework problems.

Homework: There will be 8-10 homework assignments over the course of the semester. These will include physics problems and questions from the textbook as well as short research activities such as (1) doing an inventory of your energy usage or your city’s or state’s energy usage; (2) retrieving current data on energy or environmental issues and analyzing it; (3) retrieving current data on the climate and analyzing it. In addition to counting directly toward your grade, doing your homework problems will help you prepare for your exams! If you take the time to do the homework yourself and understand it, you **will** get a higher grade in the course than if you use someone else’s solutions. As a resource, I will post videos on YouTube, linked from WebCourses, showing me working through example problems similar to the assigned homework problems.

Clicker Questions: Every day in class there will be a interactive “clicker” questions. I place clicker in quotation marks because we will use a web-based system that you access through a smartphone, laptop, tablet or other WiFi-enabled device rather than a separate physical clicker device. These questions will be used to assess your understanding of material that we have just covered so that more discussion can take place when needed and also to encourage discussion of the material between students. You must bring your device every day. If you do not have it, or it is not functioning for some reason, **check in with me at the beginning and end of class so that I can record that you were attending class even though no clicker questions were answered. That day will then count as equal to the average of your other days. You are allowed up to three of these “bad clicker days”. In addition, your three lowest-scoring clicker days will be dropped to handle unavoidable absences.** You are encouraged to collaborate with your neighbors during clicker questions. You will receive 60% credit for participation in each question, and 100% if you get the answer

correct. **There will be attendance questions that count extra and that require your presence in the classroom to answer correctly.**

Exams:

There will be three mid-term exams taken in class in addition to a cumulative final exam. ***I emphasize understanding of concepts over numerical “plug-and-chug” problem solving.*** You must have with you at least one number two (2) pencil, and a computer scored answer sheet (a pink scantron) at every exam. You also must know your student ID number and record it accurately in the proper location on the Test Form and on each written exam so that the computer can keep track of your scores as the term progresses. A calculator may be used during exams. A valid UCF photo ID card is required when you turn in your exam answer sheet.

Important Dates:

See the schedule below for the dates of exams, including the final exam, and the schedule of reading and course content. Homework and quiz assignments will be posted in WebCourses with at least 5 days notice before a quiz is due and at least 7 days notice before a homework assignment is due.

Last Day to Drop and Request Full Refund: August 23, 2018

Academic Activity (Syllabus Quiz) Completed: August 29, 2018

Withdrawal Deadline: October 26, 2018

Assignment Submission:

Quizzes will be completed on Webcourses. In general the due time will be at 11:59 p.m. Homeworks will be turned in on paper and also on Webcourses. Paper homework assignments will be collected at the start of class. Multiple page assignments should be attached by staple with your full name, assignment name, date, and PID on each page.

Grading:

Your final grade will be based on the following:

Two in-class exams (two highest of three exams): 35%

Final exam (cumulative): 25%

Homework: 20%

Webcourses Quizzes: 10%

In-Class Clicker Questions: 10%

There will be three in-class exams during the semester, and a cumulative final exam. The lowest of the regular mid-terms will be dropped. If you miss an exam for any reason, that will be your dropped exam. Therefore, you should plan to make your best effort on all mid-terms. Because the final is cumulative, it gives you an opportunity to show you have learned material from the early part of the course where you might not have done as well on earlier exams. Therefore, if it helps your grade to do so, the final exam will count for 35% of your grade and the midterms for 25%.

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All assignment and exam grades are final 72 hours after they have been returned. Contact me before this 72-hour period is over if you have a grading dispute. See the rest of the missed work policy below. Plus and minus grades (A-, B+, etc.) **will** be given. Extra credit is **not** available. The default letter grade scale is:

A: 92-100

A-: 90-91.9

B+: 88-89.9

B: 82-87.9

B-: 80-81.9

C+: 78-79.9

C: 72-77.9

C-: 70-71.9

D+: 68-69.9

D: 60-67.9

F: below 60

I reserve the right to adjust the grade scale, and the grade scale for exams will be posted after each exam with adjustments (a “curve”) if any. These adjustments will only help your grade.

Schedule

Date	Reading	Topic	Demonstrations
Aug. 21	EEC: Ch. 1	Introductions. Quantitative Pre-Test. Understanding quantitative data.	
Aug. 23	EEC: Ch. 2 SE: Ch. 1	Planet Earth. Energy and Power. Quantifying energy use.	
Aug. 28	EEC: 3.1-3.4	Forms of energy.	
Aug. 30	EEC: 3.5-3.8 SE: Ch. 2	Work, Kinetic Energy, Friction. Quantitative Estimations	
Sep. 4	EEC: 4.1-4.4	Thermodynamics	
Sep. 6	EEC: 4.5-4.7	Thermodynamics	
Sep. 11	EEC: 4.8-4.10	Thermodynamics and review of physics of energy.	

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Date	Reading	Topic	Demonstrations
Sep. 13	EEC: 5.1-5.3	Energy from fossil fuels and review.	
Sep. 18	EEC: 5.4-5.6	Fossil fuel resources.	
Sep. 20	Exam 1	All material covered to date.	
Sep. 25	EEC: 7.1-7.2	Physics of the atom.	
Sep. 27	EEC: 7.3-7.6	Nuclear power.	
Oct. 2	EEC: 9.1	Solar energy.	
Oct. 4	EEC: 9.2-9.4	Solar energy.	
Oct. 9	EEC: 9.5-9.7 SE: 6	Solar energy.	
Oct. 11	EEC: 10.1-10.2 SE: 4, 8	Hydropower. Wind.	
Oct. 16	EEC: 10.3-10.4 SE: 10	Biomass. Indirect solar energy.	
Oct. 18	Exam 2	Material covered since Exam 1.	
Oct. 23	SE: 12, 14, 16	Tallying energy production and use.	
Oct. 25	EEC: 6.1-6.2 EEC: 7.7	Air pollution, and nuclear hazards.	
Oct. 30	EEC: 11.1-11.2	Electricity and fuel cells.	

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Date	Reading	Topic	Demonstrations
Nov. 1	EEC: 12	Earth's climate. Greenhouse gases.	
Nov. 6	EEC: 13	Climate forcing.	
Nov. 8	EEC: 13	Climate forcing.	
Nov. 13	EEC: 14	Environmental impacts and physics of the climate.	
Nov. 15	Exam 3	Material covered since Exam 2.	
Nov. 27	EEC: 15 SE: 18	Scientific models and climate projections.	
Nov. 29	SE: 26, 28, 29, 31	Practical next steps.	
TBA	Final Exam	Cumulative Final Exam	

EEC refers to Energy, Environment, and Climate by Richard Wolfson. SE refers to Sustainable Energy by David MacKay.

We may adjust the schedule according to how long it takes us to cover each chapter, but exam dates will not change unless there is a major disruption such as a hurricane.

Reminder: if you have questions, please ask. If you don't understand the material: see me in office hours; make an appointment if you cannot make office hours; study with your peers.

Policies:

Missed Work Policy: It is Physics Department policy that making up missed work will only be permitted for University-sanctioned activities and bona fide medical or family reasons. Authentic justifying documentation must be provided in every case (and in advance for University-sanctioned activities). At the discretion of the instructor, the make-up may take any reasonable and appropriate form including but not limited to the following: giving a replacement exam that may include oral and/or written components, replacing the missed work with the same score as a later exam, allowing a dropped exam, replacing the missed work with the homework or quiz average. Note that for this class, the dropped exam is the default policy for a missed exam for **any** reason. This is also the policy for homework and clicker absences.

Clicker Questions Policy: The policy for Clicker Questions is different than that for homework and exam questions: **you are encouraged to work with your neighbors in class on these questions.**

Attendance Policy: Each day there will be one or more clicker questions that can only be answered correctly if you are physically present in the classroom.

Calculators and Laptops: Calculators may be used for exams and for clicker questions. You may take notes on a laptop. However, **you may not use your laptop for FaceBook, web surfing, or other activities not directly related to class.**

Academic Integrity:

The Center for Academic Integrity (CAI) defines academic integrity as a commitment, even in the face of adversity, to five fundamental values: honesty, trust, fairness, respect, and responsibility. From these values flow principles of behavior that enable academic communities to translate ideals into action.

<http://www.academicintegrity.org/ica/assets/FVProject.pdf>

UCF Creed: Integrity, scholarship, community, creativity, and excellence are the core values that guide our conduct, performance, and decisions.

1. Integrity: I will practice and defend academic and personal honesty.
2. Scholarship: I will cherish and honor learning as a fundamental purpose of my membership in the UCF community.
3. Community: I will promote an open and supportive campus environment by respecting the rights and contributions of every individual.
4. Creativity: I will use my talents to enrich the human experience.
5. Excellence: I will strive toward the highest standards of performance in any endeavor I undertake.

The following definitions of plagiarism and misuse of sources comes from the Council of Writing Program Administrators <<http://wpacouncil.org/node/9>> and has been adopted by UCF's Department of Writing & Rhetoric.

Plagiarism

In an instructional setting, plagiarism occurs when a writer deliberately uses someone else's language, ideas, or other original (not common-knowledge) material without acknowledging its source. This definition applies to texts published in print or on-line, to manuscripts, and to the work of other student writers.

Misuse of Sources

A student who attempts (even if clumsily) to identify and credit his or her source, but who misuses a specific citation format or incorrectly uses quotation marks or other forms of identifying material taken from other sources, has not plagiarized. Instead, such a student should be considered to have failed to cite and document sources appropriately.

Responses to Academic Dishonesty, Plagiarism, or Cheating

UCF faculty members have a responsibility for your education and the value of a UCF degree, and so seek to prevent unethical behavior and when necessary respond to infringements of academic integrity. Penalties can include a failing grade in an assignment or in the course, suspension or expulsion from the university, and/or a "Z Designation" on a student's official transcript indicating academic dishonesty, where the final grade for this course will be preceded by the letter Z. For more information about the Z Designation, see <http://goldenrule.sdes.ucf.edu/zgrade>. For more information about UCF's Rules of Conduct, see <http://www.osc.sdes.ucf.edu/>.

Unauthorized Use of Class Materials

There are many fraudulent websites claiming to offer study aids to students but are actually cheat sites. They encourage students to upload course materials, such as test questions, individual assignments, and examples of graded material. Such materials are the intellectual property of instructors, the university, or publishers and may not be distributed without prior authorization. Students who engage in such activity are in violation of academic conduct standards and may face penalties.

Unauthorized Use of Class Notes

Faculty have reported errors in class notes being sold by third parties, and the errors may be contributing to higher failure rates in some classes. The following is a statement appropriate for distribution to your classes or for inclusion on your syllabus:
Third parties may be selling class notes from this class without my authorization. Please be aware that such class materials may contain errors, which could affect your performance or grade. Use these materials at your own risk.

In-Class Recording Policy

Outside of the notetaking and recording services offered by Student Accessibility Services, the creation of an audio or video recording of all or part of a class for personal use is allowed *only* with the advance and explicit written consent of the instructor. Such recordings are only acceptable in the context of personal, private studying and notetaking and are not authorized to be shared with *anyone* without the separate written approval of the instructor.

Course Accessibility Statement

The University of Central Florida is committed to providing access and inclusion for all persons with disabilities. This syllabus is available in alternate formats upon request. Students with disabilities who need specific access in this course, such as accommodations, should contact the professor as soon as possible to discuss various access options. Students should also connect with [Student Accessibility Services](#) (Ferrell Commons, 7F, Room 185, sas@ucf.edu, phone (407) 823-2371). Through Student Accessibility Services, a Course Accessibility Letter may be created and sent to professors, which informs faculty of potential access and accommodations that might be reasonable.

Campus Safety Statement

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Emergencies on campus are rare, but if one should arise in our class, we will all need to work together. Everyone should be aware of the surroundings and familiar with some basic safety and security concepts.

- In case of an emergency, dial 911 for assistance.
- Every UCF classroom contains an emergency procedure guide posted on a wall near the door. Please make a note of the guide's physical location and consider reviewing the online version at http://emergency.ucf.edu/emergency_guide.html.
- Familiarize yourself with evacuation routes from each of your classrooms and have a plan for finding safety in case of an emergency. (Insert class-specific details if appropriate)
- If there is a medical emergency during class, we may need to access a first aid kit or AED (Automated External Defibrillator). To learn where those items are located in this building, see <http://www.ehs.ucf.edu/workplacesafety.html> (click on link from menu on left). (insert class specific information if appropriate)
- To stay informed about emergency situations, sign up to receive UCF text alerts by going to my.ucf.edu and logging in. Click on "Student Self Service" located on the left side of the screen in the tool bar, scroll down to the blue "Personal Information" heading on your Student Center screen, click on "UCF Alert", fill out the information, including your e-mail address, cell phone number, and cell phone provider, click "Apply" to save the changes, and then click "OK."
- If you have a special need related to emergency situations, please speak with me during office hours.
- Consider viewing this video (<https://youtu.be/NIKYajEx4pk>) about how to manage an active shooter situation on campus or elsewhere.

Deployed Active Duty Military Students

If you are a deployed active duty military student and feel that you may need a special accommodation due to that unique status, please contact your instructor to discuss your circumstances.

One Last Item:

This syllabus is subject to change. The latest version will always be available on Webcourses.

[Revision history: v1.0. May 9, 2018.]