

# PH 313 “Energy Alternatives” Syllabus, Spring 2017

## Principal Objectives

The PH313 “Energy Alternatives” is one of the Oregon State University’s Baccalaureate Core (Bacc Core) Courses. Their principal objective is to instill in students the abilities to:

1. Analyze relationships among science, technology, and society using critical perspectives or examples from historical, political, or economic disciplines.
2. Analyze the role of science and technology in shaping diverse fields of study over time.
3. Articulate in writing a critical perspective on issues involving science, technology, and society using evidence as support.

Specific aims in the Ph313 Course are given below in the Section “Specific aims”.

## SPECIFIC AIMS AND GENERAL INFORMATION FOR PH 313, Spring 2017

### SPECIFIC AIMS

#### **Student learning outcomes:**

After completing the course, the students will be able to define the energy and power, and to list the basic forms of energy, from the viewpoint of physics (kinetic and potential energy, thermal energy, electric energy, chemical energy, nuclear energy) , and a classification based on the way the power is generated (power obtained by burning fossil fuels, and power from “renewable sources”, such as hydropower, wind power, geothermal power, solar power, ocean wave power, nuclear power. They will understand the term “efficiency” and know the Carnot Law expressing the maximum efficiency of idealized thermal engines, and the formula describing the maximum efficiency of real thermal engines. They will know: the global distribution of major fossil fuels, and the approximate time periods for which the resources of each of those fuels will last. The main types of hydropower plants, including pumped storage plants. They will be able to calculate the power that wind carries, and know the efficiency and advantages/disadvantages of several types of wind turbines. They will learn about: the main characteristics of solar power reaching Earth (the total power, the geographic distribution of insolation), and the two major techniques of converting solar power to electric power (concentrated solar power plants, and photovoltaic panels); about geothermal resources, their geographic distribution, and methods of harnessing them; about the ocean wave power, techniques of converting it to electric power, with particular emphasis on the successes of Oregon State University researchers in this area; about nuclear power, major types of reactors, and problems such as nuclear power plant safety and the storage of spent nuclear fuel; about electric cars and current challenges in developing this means of transportation, i.e., making high-capacity batteries, fuel cells, and the entire infrastructure needed for making electric vehicles competitive to gasoline-powered ones; about biofuels and methods of converting biomass into gasoline- and diesel-like products; about sending electric power over large distances.

#### **Critical Thinking Skills:**

After completing the course, the students will be able to characterize the main “alternative energy” sources, to present their advantages compared to conventional methods of power production, and will be able to express learned opinions concerning the need of developing a comprehensive system based on diverse alternative energy sources that will, in a foreseeable future, replace the currently existing system based primarily on fossil fuel burning. However, the students will not be forced to necessarily think in favor of alternative energies – opposite views will not be suppressed, in accordance with the best traditions of American democracy. Yet, it will be expected that students not showing enthusiasm for “alternative energies” will be able to present quality arguments in favor of their opinions – arguments based on their good knowledge of the conventional and the “alternative” techniques of power production.

### ESSENTIAL INFORMATION

**Prerequisites:** None.

**Required Texts:** None; extensive lecture notes (in the form of a PPT presentation) related to a given “block” of the material will be posted well in advance, often together with a list of several internet addresses of sites containing additional high-quality information about various aspect of the problems that will be discussed in class.

**Exams:** There will be one midterm and a final. The final will be comprehensive, i.e. it will cover the entire course. The midterm will be given on Wednesday, May 10th during the usual lecture time (if most students prefer another day: e.g., May 8<sup>th</sup>, or 12<sup>th</sup>, we may change the date, but the decision must be made before the end of the first week). The final will be given on Friday, June 16<sup>th</sup> from 9:30 to 11:20 am – venue TBA. Exams are closed book and closed notes. **Please arrive to the exam room five to ten minutes early.**

**Term Paper:** You will write a three-to-five page paper (typed, double-spaced) on one of the following topics from a list that will be posted on the Ph313 Course Web site. However, the students may also choose “their own” topics, not necessarily those from the list. Such “extra” topics should be approved by the instructor – but if the topic is indeed related to the course material, the instructor will most probably accept it.

**Optional Outline:** You may submit an outline of your paper, rough draft or other writing sample for the instructor to read, comment on and return to you at the beginning of the following lecture. It is recommended that you submit an outline, rough draft or other writing sample for feedback before writing the final version of your paper.

**Quizzes and In-class group tasks** – once in a while I will give you a problem, and I will ask you to form small groups (3-4 people) for discussing the problem and working together on the solution. I will expect you to do honest work. Points will be given just for “trying hard”, even if the solution is not 100% correct. You will lose points only if you skip the lecture!

**Academic Integrity:** All students are expected to uphold the highest standards of honesty and integrity in their academic work. **All graded work is to be done on an individual basis.** Any incidence of academic dishonesty will be dealt with in accordance with OSU policies.

**Students with Disabilities:** Students with **documented** disabilities who need special accommodations should make an appointment with the instructor as soon as possible to discuss the accommodations. Students’ privacy is our top concern – therefore, the instructor should be contacted by e-mail in order to schedule an individual appointment at a time most convenient to the student (possibly, not during the regular office hours).

**Final Grades:** Your final grade will be computed as follows: Quizzes, classroom group work – 15 pts; Homework – 9 pts.; Midterm – 17 pts; Final – 34 pts; Term Paper – 25 pts.  
The grade scale is as follows:

90- 100% = A  
86 - 89% = A-  
82 - 85% = B+  
78 - 81% = B  
74 - 77% = B-  
70 - 73% = C+  
66 - 69% = C  
60 - 65 % = C-  
55 - 59% = D+  
50 - 54% = D  
0 - 49% = F