**PHYSICS 473—ENERGY**
**CTTI --SUMMER 2012**

**Instructor:** Dr. David B. Slavsky
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**Class meetings:** Each weekday (except July 4) from July 2 – July 18, 8:30-12:30 in Cudahy Science 314
**Texts:** Sustainable Energy: Choosing Among Options (Tester et al); An Introduction to Thermal Physics, Schroeder (both texts will be provided in class)

## **The Course:**

This is a course specifically designed for CPS High School science teachers as part of the NSF CTTI project.

The concept of energy arises in every discipline of science. Whether you are teaching biology, chemistry, physics, earth/space science or environmental science, you will examine the role and importance of energy in a variety of contexts throughout your class.

This particular course in energy will investigate the laws of thermodynamics, the role of energy in earth systems (such as the atmospheric energy budget, the role of energy in driving plate tectonics), energy resources, and energy technologies both current and future. The goal of the course is to equip teachers with the content and pedagogical tools to provide their students with richer science experiences, by teaching them how energy is one of the overarching concepts in science, and how issues of energy resources and technologies will be critical questions in the 21st Century.

## **Content**

Our primary texts in the course will be Sustainable Energy (Tester et al.) and Thermal Energy (Schroeder). Both texts will be provided in class. Tester et al. was written for an MIT graduate seminar on energy policy; the MIT course typically enrolls students from engineering, public policy and the business school, so the book covers a very broad range of topics and uses methods from both the sciences and social sciences. The Schroeder text is a more traditional thermodynamics text that has excellent treatments of basic thermodynamic topics (energy, temperature, entropy, efficiency). We will (or at least I anticipate we will) cover Chapters 1-3 and 4.1-4.3 in Tester and sections 1.1-1.6, 2.1-2.4, 2.6, 3.1-3.2, and 4.1-4.2 in Schroeder. The final portion of the course will involve investigation of different forms of energy (Chapters 7-15).

In addition to working with the texts and class discussions, we will make use of Loyola’s BioDiesel Fuel facility for three short experiments this summer, designed to illustrate the principles of thermodynamics and alternative energy sources.

## Grading

Since this is a formal, 4 hour course at Loyola, students will receive grades that will be posted to your permanent Loyola transcript. Your grade in this course will be determined according to:

In class problems/assignments: 1/3
Group presentations: 1/3
Labs: 1/3

The details of each element of grading are given below:

**In class problems:** Each day (or almost each day) I will ask the class to work on a series of projects or problems for you to turn in at the end of the class period. I will grade these and assign a score based on the following rubric:

4 pts: Answer correct, methods relevant and clearly delineated.

3 pts: Answer mostly correct; method relevant and clearly delineated.

2 pts. Answer incomplete or incorrect, method relevant and well delineated.

1 pt. Answer incorrect, method partially relevant.

0 pts. No work/method completely irrelevant.

**Group presentations:**

As you will quickly determine, the Tester et al. book is a rich source of information on a number of forms of energy, and there is simply no time in an intensive summer course to cover all or even a significant fraction of these. We will cover as many of the chapters dealing with energy technologies (7-15 excluding 9) through group presentations (the number of chapters we will do, and the number of chapters done by each group will depend on the number of participants in the class, a tally I do not know as I write this syllabus).

Each group (of either 3 or 4 participants) will take the lead in presenting one of these chapters to the rest of the class, and this presentation will consist of two parts spread over two days. The first group will present a report to the class on Chapter 7 (or designated portions of Ch. 7). This presentation will take approximately 1.5 hours and should cover the major issues of the chapter (see grading rubric below for more details). On the next day , the group will present a 20-30 minute mini-class as they might to their own high school class. The group's grade will be based on both presentations.

The grade each participant receives for the group presentation will consist of two parts. Each participant will receive both a group grade (assigned by me) and an individual, peer assigned grade.

The group grade for the presentation will be determined according to:

4 pts: Presentation clear, accurate, presents the most important elements of the chapter, makes linkages between the chapter material and previous course material.

3 pts: Presentation clear, accurate, and presents the most important elements of the chapter.

2 pts: Presentation focuses on the most important elements of the chapter, but is lacking in clarity and/or accuracy.

1 pt. Presentation misses the most important elements of the chapter, and lacks accuracy and clarity.

0 pts. Completely lacking in all regards.

The group grade for the mini-class will be determined according to:

4 pts: Clear, accurate, uses the material of the chapter explicitly.

3 pts: Uses the chapter material, but minor errors in accuracy.

2 pts: Uses the chapter material, with major errors in accuracy and lacking in clarity.

1 pt. Does not use the chapter material.

0 pts. No evidence of preparation for the class.

The two group grades will be averaged, and every member of the group will receive that group grade.

The peer assigned grade for a participant will be determined by the other participants in the group. If, say, there are 4 members in the group, each person would be graded by the other three members of the group. You will rank each of the ***other*** members (do not rank yourself) on a scale from 0-10 (10 the highest), with the constraint that your total number of points allotted must equal 5 * (N-1) where N is the total number of group members. So if your group has 4 members, you must allot 15 points among the other 3 group members.

Let me demonstrate how I will determine peer reviewed grades. Let's say there is a group which receives a group grade of 80 based on its two class presentations. Let's say the 4 group members are Abel, Bonnie, Charlie and Delta. Now, if Abel's 3 peer reviewed grades are 4, 6 and 7, (oh, your peer reviewed scores must be integers) his average peer reviewed grade is 5.67. Since 5.00 is the average score of the group, his peer reviewed score will be (5.67/5.00)x80 = 90.67. His total grade for the presentation will be the average of 80 and 90.67.

If Bonnie received scores of 2, 4, 5, her average is 3.67, and her peer reviewed score will be (3.67/5)x80=58.67. Her total grade is the average of 58.67 and 80.

The purpose of the peer reviewed grade is to ensure that everyone participates equally, and does not slack off hoping to earn a high grade on the efforts of others. In my experience, it is extremely rare for any group member to score much above or below the mean.

**Labs:**

In the second week of the course, we will go to the BioDiesel Facility (run by Zach Waickman) to do labs involving:

Production of Bio Diesel from Fuel
Calculating Combustion of Energy from Bio Diesel Fuel
Energy Balance

You will submit individual lab reports (forms will be provided) for each lab.

**Academic Honesty:**

Academic honesty lies at the heart of all scholarly work done at Loyola. While the nature of the class is clearly collaborative, there are elements (model lesson, in class problems/projects) that must be the result of your own individual effort. The first instance of submitting another's work as your own will result in a zero for that assignment; a second such instance will result in an F in the course with documentation sent to the appropriate Dean's Office. It is my expectation that we will never need to visit these issues during the course.