General Education Summit Program - War & Peace Cluster
Fall 2011
Engl 3550 - Physics section

Introduction

War & Peace is one of the clusters in the Upper Division Summit Program for the General Education Requirement. It consists of two classes, which when taken together satisfy sections F1 and F2 of Area F, and also Area G.

- Engl 3550 - Years of War, Days of Peace: Post 1945 Literature and Film. Satisfies area F2 (Humanities.) Offered in Fall.
- Phys 3550 - Physics for War, Physics for Peace. Satisfies area F1 (Mathematics and Natural Sciences.) Offered in Spring

Faculty

- Dr. Scott Davis, Department of English (Phone 667-3883, email: sdavis@csustan.edu)
- Dr. Ian M. Littlewood, Department of Physics (Phone: 667-3466, email: ian@physics.csustan.edu)

Schedule of classes

Despite the chronological order of the classes listed above, we will be teaching both Physics and English in each of the Fall and Spring semesters. During the Fall semester the class dates in the first half of the semester will be devoted to Physics. The dates in the second half of the semester will be devoted to English.

A similar arrangement will also hold for the Spring semester. Details will be announced at the beginning of that semester.

Office Hours

My office hours are flexible. Fixed office hours are 10-11 pm MWF, 1-2 pm TR, and 5-6 pm W. However you are welcome to come at any time, particularly if you can give me advance notice.

Course books

Physics

There are no assigned texts for the physics section of this cluster, either in the Fall or Spring. Instead, we will be using the Library and the Internet as our main source of
information. In addition to the regular library holdings, some texts which are used in our introductory physics classes have been placed on reserve in the library for you to refer to when necessary. For Internet resources, please see the main web page for this class (http://physics.csustan.edu/WarAndPeace/index.htm) for an extensive set of links to relevant material. The use of search engines (Yahoo, Google, etc.) will undoubtedly reveal more sources.

*English*

Please see the syllabus handed out by Dr. Davis.

**Course Objectives - Physics**

As a result of studying the physics of nuclear power and weapons, at the end of the semester you should

- Define correctly the terms which are used in Nuclear Physics.
- Be able to understand and explain the basic concepts and principles of nuclear physics.
- Be able to make a rational argument both in favor of and against the use of nuclear power stations.
- Be able to make a rational argument both in favor of and against the use of nuclear weapons.
- Be able to understand and evaluate references to nuclear power stations and weaponry in literature and film.

**Basic Knowledge - Physics**

I am going to assume that you have some basic knowledge coming into this class. Since you all come from a wide variety of backgrounds, it is quite possible that you have not seen some of the material, or need some refreshment. In that case I will be happy to help with study session(s) at time(s) to be arranged. I will be assuming the following:

*Mathematics*

- Basic knowledge of algebra.
- Basic geometry.
- Functions, especially the exponential and logarithmic functions. It will be helpful to you if you have a basic scientific calculator when working with these functions.
History
- World War II, especially the bombing of Hiroshima and Nagasaki which brought about the end of the Pacific Theater in August 1945.
- The Cold War, and its components, not all which are directly nuclear.
- MAD

General Education Program, its Goals and Relationship to Physics

There are seven goals of the General Education Program, and our cluster is required to address all of them. Each of disciplines will address each one of these goals, but to different degrees. (There are two more for the Multicultural Requirement which will be primarily addressed by the English class.) In the Physics section I shall concentrate on goals

1. Subject Knowledge. All students should gain a general and conceptual, yet reasonably detailed, knowledge of the basic concepts and principles of nuclear physics, and how these concepts are employed in the design, operation, problems, and safety features of nuclear power stations and weaponry.

2. Communication. All students will be expected to participate in class discussions on the advantages and disadvantages of nuclear power and weaponry, using the concepts and principles which have been learnt. Students should also be able to communicate ideas in written assignments.

3. Inquiry and Critical Thinking. If there is one aspect of the nuclear debate it is that the majority of the population, both and con nuclear technology, argues their case from a purely emotive stand point. As a result of this class you should be able to critically evaluate arguments put to you based on the science of nuclear technology, and to develop a coherent argument of your own.

4. Information Retrieval and Evaluation. There is no assigned text for this physics section of this course. We will be using library resources and the Internet as the primary source of information. Bear in mind, though, that the authors of many of these resources (particularly those on the Internet) are pushing a particular point of view, or who don’t know what they are talking about. It is your job to evaluate them and decide how much weight you think that you can give them.

I will also give some attention to the other three GE goals

5. Interdisciplinary Relationships. This class is designed to link the knowledge of physics to topics which will be raised in the other two disciplines of the cluster. For example, we will talk a little about the (proposed) cobalt bomb, and the reference to it in the novel
“On the Beach.” However, I will delay the discussion of why Nevil Shute writes about this particular weapon until you read this book in the second half of the semester. There are also links with disciplines outside of this cluster, such as medicine, which we will explore given sufficient time.

6. Global or Multicultural Perspectives. War is sadly a global activity, as we might hope that peace is (or will be.) We must always bear in mind that the decisions that we make about the use of technology in the United States have global consequences.

7. Social Responsibility. There are many social consequences of using technology, and we will explore this topic a little, particularly in relation to the use of nuclear power. However, there are so many other issues to be included, from medicine, to the environment, to economics, that we will not be able to fully explore this topic in the time frame of the class. I hope that you will get at least part of the puzzle.

Grading

Although Scott Davis will be the instructor of record for this class, he and I will be grading our sections separately. The final grade that you receive will be composite of the two. However, it is required that you pass both sections of the class in order to pass the class overall.

Student Debates

Each of the clusters in the GE Summit program is required to have a capstone project. This cluster requires from each student participation in debates to be held at the end of the Spring semester. It will be graded by both instructors, and by your colleagues, and form part of the grade for that semester. Although it will not form part of the grade for the Fall semester, you might want to keep it in mind so that you can plan ahead.

Debate topics will be announced no later than the first class of the Spring semester. However, we are fully prepared to discuss ideas out of class. For your information the debate topics we had last year are give below. Please be aware that there is no guarantee that any of these topics will be used again this year, or that new topics won’t be introduced.

- Debate 1 - Transportation of fission products to a dump site (Yucca Mtn., e.g.) should be forbidden
- Debate 2 - Small scale nuclear explosions for peaceful purposes (mining, e.g.) should be allowed
- Debate 3 - The development of safe, viable fusion reactors merits increased public
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investment

• Debate 4 - Unilateral nuclear disarmament is a valid foreign policy goal for the United States
• Debate 5 - Pure research, the search for knowledge for its own sake, is a worthwhile exercise
• Debate 6 - A society cannot advance in the absence of advances in science.
• Debate 7 - The struggle for survival in the aftermath of a nuclear holocaust will be pointless if our cultural heritage is lost.
• Debate 8 - Ethical restrictions on scientific research should not be imposed by outside agencies.
• Debate 9 - The environmental impact of the Chernobyl disaster outweighs the environmental impact of the Deepwater Horizon oil spill in the Gulf of Mexico
• Debate 10 - Fission reactors present a viable energy alternative to fossil fuels

List Server for the class

We have a list server for this class, which we strongly encourage you to participate in. I will be posing questions regularly (yes, I already have a lot of questions ready) for you to respond to, and your can add discussion questions or comments yourself. I shall be bringing some of the questions to class, and if you haven’t been involved you will not know what we are talking about! Participation in the list server discussions will form part of the physics portion of the grade.
To become part of the discussion group you only need to go to the web page for the class. (Start at http://physics.csustan.edu and then find the link for this class down the page.) You will find each of the questions where you can see the responses so far, and can send in your own. In order to get credit for the response you will need to identify yourself. Please be reasonably specific, just giving your name as “Bob” might not uniquely identify you. (You can respond anonymously if you want, and forego the credit.) You will also need a password, to limit the discussion to just those in the class. This password will be given in class.
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Organization of the material

The physics content of this cluster can be conveniently divided into three parts;

Basic Physics of the Nucleus
• Atomic structure, and the properties of elementary particles
• Atomic number and atomic mass
• Isotopes
• Radioactivity
• Nuclear series
• Half life and radio dating

Nuclear Devices
• Nuclear Reactions
• Chain reactions
• Reaction cross sections
• Nuclear reactors
• Fission and Fusion
• Thermal Neutrons and moderators
• Nuclear weapons
• Atomic bomb
• Hydrogen bomb

Health and Safety Issues
• Health hazards of ionizing radiation, including uv and X rays, and non-radiation hazards
• Radiation dosage, including background and cosmic radiation
• Biological processes affected by radiation
• Treatment
• Catastrophic incidents, Hiroshima, Nagasaki, Chernobyl, Three Mile Island

The plan is to cover the the section on basic physics and nuclear reactors in the Fall, then nuclear weapons and health and safety aspects during the Spring.