

# **INTD 290: Nanotechnology and Society**

## **Whittier College**

*“Teaching should be such that what is offered is perceived as a valuable gift and not as a hard duty.” -Einstein*

Class meets: Monday through Friday: 2:00-4:00pm

Classroom: Science Building room 104

Office hours: Monday through Thursday: 1:00-2:00pm @SCI 105G

Email: [szorba@whittier.edu](mailto:szorba@whittier.edu)

Phone: 562-907-4200 ext 4450

### **1. Course Introduction**

Wouldn't you want to be in the know about an unfolding here-and-now revolution called nanotechnology? Nanotechnology will rule! It is happening right now, right in front of our noses. By taking the Nanotechnology and Society course, you will learn the basic building blocks of this burgeoning technology and its potential impacts on the society. This course is not just about the nanotechnology and you and me, i.e., us, the society. If you think that the society is passive and does nothing more than consuming, then you are badly mistaken. In this course we will discover that not only is technology/nanotechnology shaping the way we live but that technology/nanotechnology itself is being molded by the society.

### **2. Course Description**

Nanotechnology is the next technological (and inevitable, in my opinion) phase in the history of our “tool use” since the dawn of our civilization. This course will introduce us to this emerging field, and will examine its societal dimensions. The format of learning in this class is going to be discussion-based.

We have a textbook and an online course reader for this course.

Textbook: Understanding the Nanotechnology by the editors of Scientific American (available in the bookstore).

Online course reader: INTD 290 Course Reader (is available as electronic reserve in the Moodle website under INTD 290 files).

Note: you can have direct access to the course website at:

<http://web.whittier.edu/physics/zorba/INTD290title.htm>

The textbook will cover the scientific aspects of nanotechnology. Each chapter therein is written by an expert in the respective field. The course reader consists of individual book chapters and articles --also written by various authors—and will be on the societal dimensions of technology and nanotechnology.

### **3. Course Objectives**

- To learn the basics of nanoscience and nanotechnology
- To study the societal implications of technology/nanotechnology
- To sharpen your critical thinking and communication skills.

### **4. Grading**

Homework: 20%

One Essay (2-3 pages): 10%

Midterm: 30% (date: Monday, June 13, 2011)

Final: 40% (date: Friday, June 24, 2011)

### **5. Academic Honesty**

You will be expected to observe all the precepts of academic honesty: no cheating, no plagiarism. Please refer to Whittier College's 2009-2011 catalog, pages 28-32, for more information on academic honesty.

## **6. Disability Accommodation**

If any of you needs a special accommodation during lectures and/or exams, please contact the Disability Services. They will be more than happy to help you.

## **7. Weekly Schedule for the Summer of 2011**

### **WEEK 1 (May 31-June 3):**

→ Introduction to Nanotechnology and Society

Course policies, Course Description and Syllabus Overview,

→ What is Science?

→ What is Technology?

→ "Origin of Industrialization," in Technology and American Society

by G. Cross and R. Szostak (in Course Reader)

→ "Little Big Science by Gary Stix," in Understanding Nanotechnology

from the editors of Scientific American

→ "War and Peace in the Global Village," by Marshall McLuhan (in Course Reader)

→ "Plenty of Room, Indeed by Michael L. Roukes," in Understanding

Nanotechnology from the editors of Scientific American

### **WEEK 2 (June 6 – June 10):**

→ "Technology as Forms of Life," Langdon Winner (in Course Reader)

→ "The Art of Building Small" by George M. Whitesides, in

Understanding Nanotechnology from the editors of Scientific American

- “Less is More in Medicine” by A. Paul Alivisatos, in Understanding Nanotechnology from the editors of Scientific American
- “Making Molecules into Motors” by R. Dean Astumian, in Understanding Nanotechnology from the editors of Scientific American
- “Does Improved Technology Mean Progress,” by Leo Marx (in Course Reader)
- “Nanobot Construction Crews” by Steven Ashley, in Understanding Nanotechnology from the editors of Scientific American
- “Do Artifacts have Politics?” by Langdon Winner (in Course Reader)

### WEEK 3 (June 13 – June 17):

#### MIDTERM EXAM June 13, 2011

- “The Incredible Shrinking Circuit” by Charles M. Lieber, in Understanding Nanotechnology from the editors of Scientific American
- Watch Stargate SG1, *Nemesis*
- “Progress Through Revolutions,” in The Structure of Scientific Revolutions by Thomas Samuel Kuhn (in Course Reader)
- “Doom and Gloom by 2100” (in Course Reader)
- Al Gore’s preface to Our Stolen Future (in Course Reader)
- “Command Performance: A Perspective on Military Enterprise and Technological Change,” by David Noble (in Course Reader)
- Hiroshima and Nagasaki bombing, Chernobyl and Fukushima Nuclear Accidents
- “The potential environmental impact of engineered nanomaterials,”

In Nature Biotechnology 21, Oct. 2003, p1166, by Vicki Colvin (in Course Reader)

#### **WEEK 4 (June 20- June 24):**

- "Clean" Fuel Cell Technology (extra material)
- "Follow the Money, Follow the Leader," in The Next Big Thing is Really Small, by J. Uldrich and D. Newberry (in Course Reader)
- "Machine Phased Nanotechnology" by Eric Drexler and
- "Computing with Molecules" by Mark Reed, in Understanding Nanotechnology from the editors of Scientific American
- Watch The Stargate SG1 episode Learning Curve (Season 3)
- "Nanotubes for Electronics by Philip Collins," in Understanding Nanotechnology from the editors of Scientific American
- "Nanotechnology and Societal Transformation" by Michael M. Crow and Daniel Sarewitz (in Course Reader)

**The FINAL EXAM will be on FRIDAY, June 24, 2011**

#### **Suggested Readings:**

- Broader Societal Issues of Nanotechnology by M. C. Roco (in Course Reader)
- There is Plenty of Room at the Bottom by Richard Feynman (in Course Reader)