

# NATURAL SCIENCE I: ENERGY AND THE ENVIRONMENT

V55.0203

**Fall 2000**

Monday and Wednesday, 2:00 p.m.– 3:15 p.m.  
Main 207

**Professor Trace Jordan**

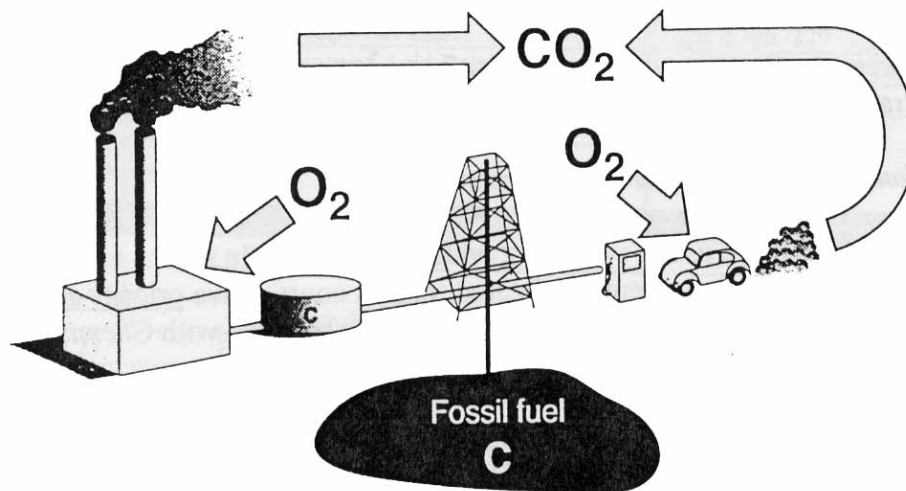
**Morse Academic Plan and Department of Biology**

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Office Hour: By Appointment



## **Course Description**

This course explores the scientific foundations of current environmental issues and their challenges for public policy. The syllabus is split into three major sections: atmosphere, water and energy. The first section begins by investigating the composition of the atmosphere and the chemical processes that cause air pollution, ozone depletion, and global warming. Moving to the study of water, the course explores the properties of this unique solvent, the effect of various aqueous pollutants, and the origin of acid rain. The course concludes with a discussion of the energetics of chemical reactions, our continuing reliance on fossil fuels, and the potential of alternative energy sources. The laboratory experiments are closely integrated with the lecture topics and provide hands-on explorations of central course themes, including a multi-week project to investigate one aspect of water quality in detail. Throughout the course we also examine how scientific studies of the environment are intimately connected with political, economic and policy concerns.

## **Course Objectives**

- To acquire a knowledge of foundational concepts, processes and terminology in chemistry.
- To develop skills in problem solving and the use of quantitative reasoning.
- To understand the methods of scientific investigation and appreciate new advances in our understanding of environmental science.
- To understand the techniques used in environmental experiments and computer simulations.
- To address the complex economic, political and policy aspects of environmental issues.

## **Course Texts, Internet Access, and Supplies**

There are two required texts for the course that are available in the NYU Bookstore:

Conrad Stanitski et al., *Chemistry in Context: Applying Chemistry to Society*, 3<sup>rd</sup> Edition (Boston: McGraw Hill, 1999)

*Laboratory Manual for Energy and the Environment.*

The course will also make extensive use of web sites, which are a valuable source of information on environmental science and policy. Students registered for this course have priority access to any NYU computer room for course-related work. The web site associated with *Chemistry in Context* is located at [\*\*www.mhhe.com/cic\*\*](http://www.mhhe.com/cic).

**Around half of the laboratory sessions will require you to use chemicals that are potentially damaging to your eyes. GOGGLES ARE ABSOLUTELY REQUIRED DURING THESE LABS. Goggles will be available for purchase at the lab sessions for a cost of \$5. If you forget your goggles for a lab where they are required, you will have to purchase another pair.**

## COURSE SCHEDULE

<i>Lect</i>	<i>Date</i>	<i>Lecture Topic</i>	<i>Reading</i>	<i>Lab</i>
		<u>SECTION A: ATMOSPHERE</u>		
				* = goggles required
		Air Pollution		
1	W Sept 6	The Air We Breathe	Ch. 1, pp. 1-10	Risk Assessment
2	M Sept 11	The Atmosphere	Ch. 1, pp. 10 - 28	
3	W Sept 13	Air Pollution	Ch. 1, pp. 28 - 40	Properties of Air*
		<u>The Ozone Layer</u>		
4	M Sept 18	Atoms and Molecules	Ch. 2, pp. 45 - 55	
5	W Sept 20	Properties of Light	Ch. 2, pp. 56 - 60	Properties of Light*
6	M Sept 25	The Ozone Layer	Ch. 2, pp. 60 - 73	
7	W Sept 27	CFCs and Ozone Depletion	Ch. 2, pp. 73 - 88	Spectroscopy*
		<u>Global Warming</u>		
8	M Oct 2	The Earth's Energy Balance	Ch. 3, pp. 93 -101	
9	W Oct 4	Molecular Structure	Ch.3, pp. 101 - 108	Molecular Modeling
10	M Oct 9	The Carbon Cycle and CO <sub>2</sub> Emissions	Ch 3., pp. 108 - 119	
11	W Oct 11	Global Warming – Science and Policy	Ch. 3, pp. 119 - 132	Review
	M Oct 16	<u>Midterm Exam 1</u>		
		<u>SECTION B: WATER</u>		
		<b>Water Quality</b>		
12	W Oct 18	Drinking Water Resources	Ch. 5, pp. 183 - 192	Water Hardness*
13	M Oct 23	Properties of Water	Ch. 5, pp. 192 - 201	
14	W Oct 25	Water Quality	Ch 5., pp. 201 - 209	Testing Ions in Water*
15	M Oct 30	<u>Case Studies: Water Pollution</u>	Ch 5., pp. 21 - 224	

16	W Nov 1	<b><u>Chemical Carcinogens</u></b>	Ch. 12, pp. 454 - 466	Water Project 1*
		<u>Acid Rain</u>		
17	M Nov 6	Acids and Bases	Ch. 6, pp. 229 - 236	
18	W Nov 8	Origin of Acid Rain	Ch. 6, pp. 236 - 249	Water Project 2*
19	M Nov 13	Effects of Acid Rain & Buffering	Ch. 6, pp. 249 - 254	
20	W Nov 15	Acid Rain Legislation	Ch 6., pp. 254 - 260	Water Project 3*
	M Nov 20	<b>Midterm Exam</b>		
	W Nov 22	<i>No Class</i>		<i>No Lab – Thanksgiving</i>
<b>SECTION C: ENERGY</b>				
		<u>Energy &amp; Fossil Fuels</u>		
21	M Nov 27	Energy of Chemical Reactions	Ch. 4, pp. 136 - 154	
22	W Nov 29	Fossil Fuels	Ch. 4, pp. 154 - 167	Project Presentations
		<b>New Energy Sources</b>		
23	M Dec 4	Batteries & Fuel Cells	Ch. 8, pp. 305 - 322	
24	W Dec 6	Solar Cells	Ch. 8, pp. 322 - 328	Course Review
25	M Dec 11	Challenges for the 21 <sup>st</sup> Century		

### Grade Allocation

Midterm Exam 1	15 %	Monday, October 16, 2:00 – 3:15 p.m.
Midterm Exam 2	15 %	Monday, November 20, 2:00 – 3:15 p.m.
Final Exam	25 %	Monday, December 18, 2:00 – 3:50 p.m.
<b>Laboratory</b>	<b>35 %</b>	
<b>Homework</b>	<b>10 %</b>	

In-class assignments will be regularly given out in lectures, and some of these will be collected and reviewed. There will be no formal grade component for these assignments, but they will be used in deciding cases of borderline grades.

### Exam Format and Policies

- The exams will contain questions covering the lectures, readings, and laboratory projects. Before each exam, a set of study questions for the lecture topics will be distributed. The final exam will be **cumulative** and integrate topics from throughout the course. Homework assignments provide practice with some types of questions that will appear on the exams.
- If you will miss one midterm exam because of illness, you must contact Professor Jordan by e-mail before the start of the exam and provide a doctor's note explaining your absence. No make-up exams will be given for the course. Instead, the final exam will count as 45 % of your course total. Since the final is cumulative and the most difficult exam of the course, this option is not advisable unless extreme circumstances prevail. If you miss two midterm exams you will be required to withdraw from the course.
- A make-up will be given for the final exam only for an exceptional reason that must be discussed with Professor Jordan prior to the exam. In this case a grade of incomplete will be given for the course and the make-up will be scheduled for the fall 2000 semester. No alternative date for the final exam will be offered at the end of the spring semester. Please avoid making travel plans to leave NYU before the date of the final exam.

### Homework Format and Policies

- The homework assignment will contain questions that review the course material and/or questions that relate to the lab project. Certain questions on the homework assignments may require you to access information on relevant web sites. Each homework assignment will contain 10 questions, of which 3 will be graded. Each homework assignment will be worth 10 points, with 3 points per graded question and 1 point for completing all the questions.

- All work must be submitted **on time** for full credit. Any late assignments must be placed in the mailbox outside Main 202 and will be penalized **5 points per day** (excluding weekends). If you miss a lecture or laboratory session due to a documented absence you are still required to complete the homework assignment. Contact your laboratory instructor to arrange a suitable deadline for completion of the work.

## LABORATORIES

(For Full Description of Laboratory Experiences see CD-rom)

The laboratory sessions will be held in Main 202 and will begin on Thursday, September 7.

The labs will be taught by three skilled instructors and the best way to contact your instructor is by e-mail.

Christine Espiritu

Raul Hernandez

Maria Oliveras

**Cesprit@hotmail.com**

**Raulshernandez@aol.com**

**MdL0599@aol.com**

<i>Lab Section</i>	<i>Day and Time</i>	<i>Lab Instructor</i>
Section 2	Thursday, 11:00 a.m. – 12:40 p.m.	Raul Hernandez
Section 3	Thursday, 1:00 p.m. – 2:40 p.m.	Raul Hernandez
Section 4	Thursday, 3:00 p.m. – 4:40 p.m.	Maria Oliveras
Section 5	Thursday, 5:00 p.m. – 6:40 p.m.	Maria Oliveras
Section 6	Friday, 11:00 a.m. – 12:40 p.m.	Christine Espiritu
Section 7	Friday 1:00 p.m. – 2:40 p.m.	Christine Espiritu

### **Laboratory Policies**

- You must be registered in a laboratory section in order to receive credit for the course. The sections have a capacity of **21 students**, which is determined by the availability of equipment and the size of the room. The lab capacity will not be increased for any reason. If you are not appropriately registered for a lab section by lab # 3 (September 21/22) you will be required to drop the course.
- You are expected to arrive punctually for the beginning of the lab session and arriving more than 10 minutes late will result in a loss of attendance credit for the session.
- You will be at a serious disadvantage in the course if you miss any of the lab

sessions. If you cannot attend a lab session because of illness, notify your lab instructor before the start of the lab session and obtain a doctor's note. This note must be provided no later than two weeks from the date of the missed lab. Failure to follow these procedures will result in a score of zero for the lab project.

- If you will miss a lab session due to special circumstances, including observation of a religious holiday, you must notify your lab instructor in advance.
- Missing more than three laboratory sessions for any reason (excused or unexcused) will result in receiving a score of zero for the entire laboratory component of the course.

### **Laboratory Assignments**

### **Weekly Experiments**

- Laboratory work until the beginning of the water projects will consist of weekly experiments. These experiments have been designed to cover central topics in the lectures and to provide you with the opportunity to become skilled at scientific observation and data interpretation. Some of the experiments also use computers since they are now a central tool in scientific investigation.
- Each weekly experiment is worth 50 points:

Attendance	10 points
Quiz	10 points
Lab Assignment	30 points
- Questions for the laboratory quiz will be based on the description of the experiment in the laboratory manual and may also include pertinent material from the lectures and readings. Arriving more than 10 minutes late for the lab will exclude you from taking the quiz.
- The lab assignment must be completed and submitted during the laboratory period by working collaboratively with your laboratory partners.
- There are three exceptions to this schedule.
  - (a) There will be no graded quiz for lab #1 on *risk assessment*. However, there will be a non-graded quiz during the lab to assess your knowledge of environmental topics.
  - (b) The lab session for October 12/13 will be devoted to a review before the first Midterm Exam.
  - (c) The lab session during the week of Thanksgiving will not be held.

### **Water Quality Projects**