

COURSE INFORMATION AND OBJECTIVES
EARTH SYSTEMS SCIENCE I
PGEOG250 Fall 2008

Professor Allan Frei

CLASS SCHEDULE:

LECTURES: Tuesday / Friday, 3:45-5:00, Room 1022 Hunter North

LABS: Section 1: Friday, 2:10-3:00, Room 1090B Hunter North

Section 2: Tuesday, 2:10-3:00, Room 1090B Hunter North

PROFESSOR FREI CONTACT INFORMATION:

Office 1035 Hunter North

E-mail afrei@hunter.cuny.edu

Tel. 212-772-5322

Office Hours: by appointment

COURSE DESCRIPTION & OBJECTIVES

In this course we learn to think of our planet as a system. A system consists of several components that interact with each other, sometimes in very complicated fashions. The components of the earth system that we will consider include the atmosphere, the hydrosphere, the lithosphere, and the biosphere. While each of these components can, and should, be studied in more detail in separate courses, here we focus on interactions between them.

The three main objectives of this course are:

1. To introduce students to “systems thinking” in the context of the earth system. Systems-thinking is critical in all areas of study, and particularly in the fields of environmental studies and earth sciences.
2. To introduce students to quantitative analysis. In the lab portion of this course we will be introduced to some of the concepts necessary to study environmental systems in a quantitative fashion. Labs are meant to provide students with a number of identifiable skills that can be applied in other courses as well as in work environments.
3. To provide students with a sufficiently broad, yet integrated, understanding of the earth system to identify particular areas or sub-disciplines that they would like to pursue in more detail.

COMPUTER LABS

Computer labs will be held once per week in room 1090B North. Labs will consist of exercises designed to introduce students to some of the concepts and skills necessary to study environmental systems in a quantitative fashion. These include basic mathematical concepts, as well as using computer simulations, or models, to understand the earth from a “systems dynamics” perspective. STELLA® modeling software will be used in modeling exercises. No previous experience in computer modeling or STELLA software

is expected, although basic familiarity with the Windows operating system, MS WORD and MS EXCEL, is expected. Computer labs will be provided to you.

Most labs take 2 weeks. Labs are expected to be emailed to the professor before the beginning of the next lab.

GROUP WORK – is allowed for all labs except labs 1, 2, and 5. If students choose to work in groups, students must: (1) inform the professor before the due date which students are working together; and (2) hand in only one lab per group, with all students names on the lab.

PREREQUISITES

Each student must have passed at least one 100-level science course, or have permission of the instructor. Basic familiarity with the Windows operating system, and Microsoft Word and EXCEL, are assumed. Students will be taught to use additional software for running computer simulations in the laboratory.

REQUIRED TEXT BOOKS

Students must obtain their own copies of:

Kump, Kasting, and Crane, 2004, *The Earth System*, 2nd edition, Pearson / Prentice Hall Publishers. This book has been ordered at the Hunter College book store, as well as at Shakespeare & Co. on Lexington Avenue.

ADDITIONAL READINGS AND LAB MATERIAL will be provided, including excerpts from the following:

Bowler and Morus, *Making Modern Science*, University of Chicago Press, 2005

Greenleaf, Frederick P., *Quantitative Reasoning: Understanding the Mathematical Patterns in Nature*, McGraw-Hill

Lab exercises that have been designed specifically for this course

GRADES

Grades are based on lab work, two midterm exams, one final exam, and four low-impact assignments (two labs and two written).

Labs	24%
Midterm 1	20%
Midterm 2	24%
Final	24%
Low impact	8%

EXAMS

Three exams will be given, two in-class midterm exams and one final exam. See the syllabus for exam dates and information about which chapters will be covered.

LOW IMPACT ASSIGNMENTS

There are 2 low impact labs (labs 1 and 2), and two low impact assignments. Low impact assignments are graded on a pass/fail basis. All students are expected to pass and get full

credit for low-impact assignments. The only way a student can fail to get credit is (a) if you do not hand it in on time, or (b) you are obviously not trying to fulfill the assignment. If you want credit, all you have to do is try. The purpose of these low impact assignments is to allow students to think about particular issues without the pressure of grades.

ATTENDANCE

Attendance is required at all lectures and labs. Up to two unexcused absences from lectures will be tolerated. Only one unexcused absence is allowed from lab sessions. Every unexcused absence after the maximum allowable limit will result in a decrease of 5% from the student's grade in the course.

COURSE SCHEDULE
 EARTH SYSTEMS SCIENCE
 PGEOG250, Fall 2008

This schedule is tentative (Subject to change)

“chapters” refers to Kump, Kasting, and Crane text unless otherwise specified

“B&M” refers to chapters from Bowler and Morus, which will be provided to you

SESSION #	DATE	DAY	LECTURES	REQUIRED READING/ASSIGNMENT DUE ON THAT DAY	FRIDAY LAB	TUESDAY LAB
1	8/29	F	Introductory lecture, Chapter 1 – Global Change		Lab 1. Introduction to EXCEL, Scientific Notation, Logarithms, unit conversion (low impact)	
2	9/2	T	Ch. 1 (continued)	Ch. 1 – Global Change		Lab 1
3	9/5	F	Ch. 3 – Global Radiation Balance	Ch. 3 – Global Radiation Balance p. 34-40	Lab 2. Scientific notation and working with units (low impact)	
4	9/9	T	Ch. 3 (continued)	Ch. 3, p. 41-48		Lab 2
5	9/12	F	Ch. 3 (continued)	Ch. 3, p. 48-end of chapter	Lab 3. Earth Radiation Balance	
6	9/16	T	Ch. 2 – Systems Thinking	Ch. 2 – Systems Thinking p. 18-23		Lab 3
7	9/19	F	Ch. 2 (continued)	Ch. 2, p. 23-end of chapter	Lab 3 (continued)	
8	9/23	T	B&M ch. 5 – The Age of the Earth <i>Review for midterm 1</i>	B&M ch. 5 – The Age of the Earth low impact assignment #1		Lab 3 (continued)
9	9/26	F		MIDTERM 1 EXAM ch. 1-3	Lab 4. Daisyworld	
	9/30	T	NO CLASS			
10	10/3	F	Ch. 4 – The Atmosphere	Ch. 4 p. 55-63	Lab 4 (continued)	
11	10/7	T	Ch. 4. (continued)	Ch. 4 (cont’d) p. 63-68		Lab 4
12	10/10	F	Ch. 4. (continued)	Ch. 4 (cont’d) p. 68-end of chap.	Lab 5. Geometric progressions and growth, and the exponential and logarithmic functions	
	10/14	T	NO CLASS			
13	10/17	F	Ch. 4. (continued)	Ch. 4 (cont’d)	Lab 5 (continued)	

14	10/21	T	Ch. 5 – The Oceans	Ch 5 p. 83-87		Lab 4 (continued)
15	10/24	F	Ch. 5 (continued)	Ch. 5, p. 87-91	Lab 6. Measurements, Meteorological measurements, discuss low impact assignment #3	
16	10/28	T	Ch. 5 (continued)	Ch. 5, p. 91-end of chapter		Lab 5
17	10/31	F	Ch. 6 – Modeling	Ch. 6 – modeling p. 104-111	Lab 7. Thermal Damping, response times, seasons	
18	11/4	T	Ch. 6 (continued)	Ch. 6, p. 111 – end of chapter		Lab 5 (continued)
19	11/7	F	<i>Review for midterm 2 exam,</i> Ch. 7 – Solid Earth	<i>Study for midterm exam</i>	Lab 7 (continued)	
20	11/11	T		MIDTERM 2 EXAM ch. 4-6		Lab 6
21	11/14	F	Ch. 7 (continued)	Ch. 7	Lab 8. The Carbon Cycle	
22	11/18	T	Ch. 8 – The Carbon Cycle	Ch. 8, p. 147-152		Lab 7
23	11/21	F	Ch. 8 (continued)	Ch. 8, p. 153-158	Lab 8 (continued)	
24	11/25	T	Ch. 8 (continued)	Ch. 8, p. 158-161		Lab 7 (continued)
	11/28	F	NO CLASS			
25	12/2	T	Ch. 8 (continued)	Ch. 8, p. 161-end of chapter		Lab 8
26	12/5	F	The Scientific Method	<i>No reading assignment</i>	Lab 8 (continued)	
27	12/9	T	Review for Final Exam			Lab 8 (continued)
	12/12	F	NO CLASS			
28	12/16	T	B&M ch. 10 – Continental Drift	B&M ch. 10 – Continental Drift low impact assignment #2	<i>LAB 8 IS DUE</i>	Lab 8 (continued)
	12/19	F	NO CLASS			<i>LAB 8 IS DUE</i>
FINAL EXAM	12/23 1:45 – 3:45	T		Final Exam – Ch. 7,8		

LOW IMPACT ASSIGNMENTS

The purpose of low impact assignments is to allow students to perform written assignments without the pressure of grades. It is meant to give you a chance to write an assignment without worrying about too many details such as grammar, etc... In ESS-1 there are two low impact assignments.

Deadline for low impact assignments

Students are expected to email the assignments to Prof. Frei so that he receives it BEFORE the beginning of class on the due date. **Late assignments will not be accepted!!!!**

Format of your assignments

Everything you hand in should be typed in MS WORD or some equivalent word processing program. You should use **12-point font, single spaced with 1-inch margins.**

Low Impact Assignment 1: Chapter 5 from B&M, The Age of the Earth

The first low impact assignment has two parts. For the first part, read the chapter, which is provided to you in a pdf file, and write a 1 to 2 page chapter-summary in your own words. Don't forget to mention what the main points of the chapter were, and what the conclusions were. This summary is expected to be in your own words.

For the second part of the assignment, choose one of the names from the following list. Do an internet, or library search, on these individuals, and provide a ½ to 1 page summary of the person, including where and when they lived, what their main contributions were to science (some of them will have many), and in particular which contributions were relevant to the subject of the chapter we read. This summary can be taken largely from a source that you found, as long as you provide the reference to the source.

List of names:

James Hutton

Charles Lyell

Stephen Jay Gould

Robert Hooke

Georges Louis Leclerc, comte de Buffon

Alexander von Humboldt

Lord Kelvin (William Thomson)

Low Impact Assignment 2: Chapter 10 from B&M, Continental Drift

Read the chapter, which is provided to you in a pdf file, and write a 1 to 2 page chapter-summary. Don't forget to mention what the main points of the chapter were, and what the conclusions were. Your summary is expected to be in your own words.