

PGEOG 25000 – Spring 2017
EARTH SYSTEMS SCIENCE I
Syllabus for Lecture and Lab
Professor Allan Frei
V1 November 21, 2016

CLASS SCHEDULE:

LECTURES: Monday/Thursday, 9:45-11:00 AM, Room 1022 Hunter North
LABS: Thursday, 11:10-12:00, Room 1090B-2 Hunter North

PROFESSOR CONTACT INFORMATION (Best way to contact me is by email)

Office: Department of Geography, Room 1005 Hunter North
E-mail: afrei@hunter.cuny.edu
Telephone: 212-772-5322
Office Hours: by appointment only

Course Overview

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 course consists of lectures, labs, and additional low-impact assignments, each of which is described in this syllabus. Grades are based on exams, participation, lab assignments, and low impact reading / writing assignments.

Expected Learning Outcomes

There are eight learning outcomes identified for this course. The first four are theoretical-based and related to the lecture portion of this course and to the text book. The last four are skills based and are related to the lab portion of the course and to the low-impact assignments.

1. Explain what “systems thinking” is (in general, not specifically to the earth system).
2. Define the earth system and its major components.
3. Describe the physical processes that control the large scale dynamics within each major component of the earth system.
4. Describe how the major components of the earth system interact with each other as a system.
5. Perform basic quantitative analysis using Excel.
6. Perform basic data visualization using graphs and charts in Excel
7. Perform simple computer modeling experiments using educational software such as STELLA.
8. Describe some major characteristics of the “process of science.”

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.

Required Text Book

There is one required text book. Students must obtain their own copies of:

Kump, Kasting, and Crane, 2009 *The Earth System*, [IBNS-10: 0-32-159779-6; IBNS-13: 978-0-32-159779-3] (either 2nd edition or 3rd edition is acceptable), Pearson / Prentice Hall Publishers. This book has been ordered at the Hunter College book store, and can be obtained online. See table at the end of this file for outline of differences between the two editions

Additional Reading Material

Additional readings for lab assignments and low impact assignments will be provided as pdf files or are available on line. These include portions of the following:

- Greenleaf, Frederick P., *Quantitative Reasoning: Understanding the Mathematical Patterns in Nature*, McGraw-Hill, 0073390658
- Carpi and Egger, Visionlearning.com, *The Process of Science*, <http://www.visionlearning.com/en/>
- Silver, Nate, 2012, *The Signal and the Noise: Why So Many Predictions Fail – but Some Don't*, Penguin Books, (Chapter 4)

Classroom policies: You are expected to have read the reading listed for each class day *before class on that date*. No electronic devices (phones, lap tops) are to be used in class.

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. Each unexcused absence after the maximum allowable will result in a decrease of 5% from the student's final grade.

Grades

Grades are based on lab work, two midterm exams, one final exam, and three low-impact reading/writing assignments.

Exams	45%
Lab Assignments	30%
Low Impact Assignments	15%
Participation in class	10%

Lectures

Lectures, given twice per week, correspond to readings in the text book. Students are expected to read the assigned portions of the text book prior to the lecture.

Labs

Computer labs, held once per week, consist of exercises designed for this course to introduce students to introductory 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 required, although basic familiarity with the Windows operating system, MS WORD, and MS EXCEL, is expected. Most labs take 2 weeks. Most lab assignments cannot be completed during the weekly lab hour: therefore, students will be required to work on labs as “homework.” Completed lab assignments should be emailed to the professor before the beginning of the next lab.

Low Impact Lab Assignments

There are 2 ‘low impact’ lab assignments (labs 1 and 2). These are graded on a pass/fail basis. All students are expected to pass and get full credit by (a) handing in the assignment on time, and (b) making a legitimate effort to complete the assignment. If it is clear that the student performed the work in a perfunctory fashion then no credit will be given. The purpose of these low impact assignments is to allow students to focus on the mathematics without the pressure of grades.

Group work on lab assignments is allowed for all labs except labs 1, 2, and 5. For group lab assignments students must: (1) inform the professor IN ADVANCE which students are working together; and (2) hand in group lab reports with the name of each participating student appearing at the top of the assignments. Students working individually on any lab, including labs 1, 2, and 5, are allowed to discuss the assignments with other students; but the work MUST be performed and submitted individually.

Low Impact Reading / Writing Assignments: The Process of Science

This semester will include three low impact reading / writing assignments related to the process of science. You may have heard the term “the scientific method” which refers to the theoretical way that scientific analysis was originally conceived. “The process of science” refers to way that the method is actually employed in real situations, including issues such as the human element, biases, funding, practical problems, etc. In these three assignments we touch on only a few of many aspects of this issue. These assignments are described in more detail in a separate document. The purpose of low impact reading / writing assignments is to allow students to focus on the material without the pressure of grades.

Exams

The three exams are based mostly on the textbook and lecture, but may include lab material. Grades follow Hunter’s grading system (<http://catalog.hunter.cuny.edu/content.php?catoid=15&navoid=1433>). Two in-class midterm exams are 1 hour and 15 minutes; the final exam is 2 hours. If you arrive late, you lose that time. Make-up exams are ONLY available in cases with medical or some other documented unavoidable circumstance. A missed exam is graded as a zero. The CR/NCR option will be available only if the conditions stated in the CR/NCR form are satisfied: all course work has been completed and you earned grades such that you accumulate at least 50 points total in the course (this includes labs and exams). Students on academic probation are not eligible for this option. Students must make an appointment to discuss this option with me at least one week before the final exam. CR/NCR credits must be submitted **no later than Thursday, May 18**.

Lab and low impact assignment format: All assignments must be submitted in either WORD (doc) or pdf format; or, when a spreadsheet is required, as an Excel file. File names should start with your last name, followed by the assignment name. Please email all assignment files to Prof. Frei (afrei@hunter.cuny.edu).

Hunter College Policy on Academic Integrity:

Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The College is committed to enforcing CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures.

See the following report by the Hunter College Senate for more details:

<http://www.hunter.cuny.edu/senate/assets/Documents/Hunter%20College%20Policy%20on%20Academic%20Integrity.pdf>

ADA Policy

In compliance with the American Disability Act of 1990 (ADA) and with Section 504 of the Rehabilitation Act of 1973, Hunter College is committed to ensuring educational parity and accommodations for all students with documented disabilities and/or medical conditions. It is recommended that all students with documented disabilities (Emotional, Medical, Physical, and/or Learning) consult the Office of AccessABILITY, in Room E1214B, to secure necessary academic accommodations. For information and assistance: (212)772-4857 or (212)650-3230.

PGEOG 25000 – Spring 2017 ESSI
Additional Information

Chapter Titles for Second and Third editions of text book

Titles listed in red are different for the two editions

PG25000 (ESS 1) GOES THROUGH CHAPTER 8 ONLY.

SECOND EDITION	THIRD EDITION
1. Global Change	1. Global Change
2. Daisyworld: An Introduction to Systems	2. Daisyworld: An Introduction to Systems
3. Global Energy Balance: The Greenhouse Effect	3. Global Energy Balance: The Greenhouse Effect
4. The Atmospheric Circulation System	4. The Atmospheric Circulation System
5. The Circulation of the Oceans	5. The Circulation of the Oceans
6. Modeling that Atm-Ocean System	6. The Cryosphere
7. Circulation of the Solid Earth: Plate Tectonics	7. Circulation of the Solid Earth: Plate Tectonics
8. Recycling of the Elements	8. Recycling of the Elements
9. Focus on the Biota: Metabolism, Ecosystems and Biodiversity	9. Focus on the Biota: Metabolism, Ecosystems and Biodiversity
10. Origin of the Earth and of Life	10. Origin of the Earth and of Life
11. Effect of Life on the Atmosphere: The Rise of Oxygen and Ozone	11. Effect of Life on the Atmosphere: The Rise of Oxygen and Ozone
12. Long-Term Climate Regulation.	12. Long-Term Climate Regulation.
13. Biodiversity Through Earth History.	13. Biodiversity Through Earth History.
14. Pleistocene Glaciations.	14. Pleistocene Glaciations.
15. Short-Term Climate Variability	15. Global Warming, Part 1: The Scientific Evidence.
16. Global Warming	16. Global Warming, Part 2: Impacts, Adaptation, and Mitigation
17. Ozone Depletion.	17. Ozone Depletion.
18. Human Threats to Biodiversity.	18. Human Threats to Biodiversity.
19. Climate Stability on Earth and Earth-Like Planets.	19. Climate Stability on Earth and Earth-Like Planets.

TENTATIVE CLASS SCHEDULE (SUBJECT TO CHANGE) through Midterm 1

	Date	Day	Lectures	Required Reading Due Today	Labs	Assignment Due Today
1	1/30	M	Introduction. Ch. 1 – Global Change		Lab 1	
2	2/2	Th	Ch. 1 (cont'd)	Ch. 1 – Global Change		
3	2/6	M	Ch. 3 – Global Energy Balance	Ch. 3 – Radiation Balance	Lab 2	
4	2/9	Th	Ch. 3 (cont'd) (F schedule)	Ch. 3 – Planetary Energy Balance	Lab 3	Lab 1 and Lab 2
	2/13	M	College Closed			
5	2/15	W	College on a Monday Schedule Ch. 3 (cont'd)	Ch. 3 – Effect of clouds. Climate Feedbacks		
6	2/16	Th	Ch. 2 – Systems Thinking	Ch. 2 – Systems Approach		
	2/20		College Closed			
7	2/23	Th	Ch. 2 (cont'd)	Ch. 2 – Daisyworld climate system		
8	2/27	M	<i>Meet in lab</i> Review midterm 1; Lab 3 (cont'd)	<i>Lecture and lab meet in lab today</i> Prepare questions	Lab 4 Intro to STELLA software	
9	3/2	Th	Midterm 1	Chapters 1, 2 and 3		

TENTATIVE CLASS SCHEDULE (SUBJECT TO CHANGE) through Midterm 2

	Date	Day	Lectures	Required Reading Due Today	Labs	Assignment Due Today
10	3/6	M	Ch. 4 – The Atmosphere	Ch. 4 – Global circulation	Lab 4 (cont'd) Daisy World	
11	3/9	Th	Ch. 4. (cont'd)	Ch. 4 – Forces. Temperature distribution		Lab 3
12	3/13	M	Ch. 4. (cont'd)	Ch. 4 – Precipitation	Lab 5	Lab 4
13	3/16	Th	Ch.4 (cont'd)	Ch. 4 – Finish chapter		
14	3/20	M	Ch. 5 – The Oceans	Ch. 5 – Surface and Boundary currents	Lab 5 (cont'd)	
15	3/23	Th	Ch. 5 (cont'd)	Ch. 5 – ENSO		
16	3/27	M	Ch. 5 (cont'd) (F schedule)	Ch 5. Role of the ocean in the Earth's climate system	Lab 7	Lab 5
17	3/30	Th	Ch. 7 – The Solid Earth	Ch. 7 – Anatomy of Earth		
18	4/3	M	Process of Science	Process of Science assignment 1	Lab 7 (cont'd)	Process of Science Assignment 1

19	4/6	Th	Ch. 7 (cont'd)	Ch. 7 – Plate Tectonics		
	4/10, 4/13, 4/17		College Closed			
20	4/20	Th	College on a Monday schedule Review midterm 2	Prepare questions	Lab 6	Lab 7
21	4/24	M	Midterm 2	Chapters 4 and 5		

TENTATIVE CLASS SCHEDULE (SUBJECT TO CHANGE) through Final Exam

	Date	Day	Lectures	Required Reading Due Today	Labs	Assignment Due Today
22	4/27	Th	Ch. 8 – The Carbon Cycle	Ch. 8 – Systems approach to C cycle	Lab 8	
23	5/1	M	Ch. 8 (cont'd), brief intro to lab 8	Ch. 8 – Long-term organic C cycle		
24	5/4	Th	Ch. 8 (cont'd)			
25	5/8	M	Process of Science	Process of Science assignments 2 & 3	Lab 8 (cont'd)	Process of Science assignments 2 & 3
26	5/11	Th	Ch. 8 (cont'd)			
27	5/15	M	Ch. 8 (cont'd), or extra lecture on extreme events	Ch. 8 – Finish chapter	Lab 8 (cont'd)	
28	5/18	Th	Review for Final Exam; final discussion on The process of science: publishing research	Prepare questions		
	5/20	F				Lab 8
	5/24	Th	11:30 AM to 1:30 PM FINAL EXAM: chap 7, 8, Lab 8			