**COURSE INFORMATION AND OBJECTIVES**
**EARTH SYSTEMS SCIENCE I**
**PGEOG 250 - Fall 2012**
Professor Haydee Salmun

**CLASS MEETINGS:**
LECTURES: Tuesday /Friday, 11:10-12:25, Room 1022 Hunter North
LABS: Section 1: Tuesday, 10:10-11:00, Room 1090B Hunter North
Section 2: Friday, 10:10-11:00, Room 1090B Hunter North

**PROFESSOR SALMUN CONTACT INFORMATION:**
Office Geography Department, Room1041 Hunter North
E-mail hsalmun@hunter.cuny.edu (*)
Tel. 212-772-5224
Office Hours: Tuesday/Friday, 2:00 – 3:00, ***by appointment***.

* **Note**: the best way to contact me is via email – (1) You must include the course name or number in your subject line (2) You must include your entire name in your email (3) I try to answer all email within 24 hours. Allow for a 48 hour delay on the weekends.

> ***Except for changes that substantially affect implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change with advance notice. Updates will be posted regularly on BlackBoard.***

**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.

**EXPECTED LEARNING OUTCOMES**
**1.** *Theory*
At the end of the semester, students would be expected to have a basic understanding of

- the convincing observational data that are used by scientists to study global change

- the events in Earth's history that illuminate how the Earth as a system responds to stress
- how to explore the way the Earth 'works' by studying processes active on Earth's surface
- how these processes function together to determine and regulate Earth's climate, the circulation of the atmosphere and ocean and the recycling of elements

**2.** *Skills*

At the end of the semester, students would be expected to have acquired basic quantitative skills that will allow them to

- use basic mathematical calculations to quantify physical processes under study
- understand the importance of data visualization and explain graphs and charts in detail
- use basic computer software such as EXCEL to perform calculations and generate charts
- gain a basic appreciation of modeling environmental systems through the use of the STELLA software

## COMPUTER LABS

Computer labs will be held once per week in room 1090B Hunter 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. For these labs, discussions and consultations are allowed but the work MUST be individual. If students choose to work in groups, students must: (1) inform the professor which students are working together; and (2) hand in INDIVIDUAL lab reports, written in the student's own words and style.

## 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*, ***[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

**ADDIONAL 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 | 30% |
| Exams | 60% (2 midterms & a final, @20% each) |
| Low Impact | 10% |

**EXAMS**
The exams will be based on the material covered in class, in the textbook and concepts that are learned through the lab portion of the course. The exam dates are CLEARLY posted in the syllabus of the course. The dates are set from day one and cannot be changed. 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.

**About examinations and grades:**

a) Grades follow Hunter's grading system: 90-100 = A; 80-89 = B; 70-79 = C; 60-69 = D; <59 = F.
b) Examinations are 1 hour and 25 minutes for the mid-term and 2 hours for the final exam and must be turned in promptly. If you arrive late, you lose that time.
c) Make-up exams are ONLY available in extreme cases, and with medical (or other) forms that confirms the absence. If you miss an exam and have a D or F average in the course at that point, you fail the course irrespective of the reason you missed it.
d) I will automatically agree to the CR-NCR option 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+exams+extra, if you earned any). Students on probation are not eligible for this option.

**REVIEW, READING QUESTIONS (LOW IMPACT ASSIGNMENTS) (*)**
There are 2 'low impact' lab assignments (labs 1 and 2, focus on review of basic background) and two 'low impact' written assignments (which focus on critical reading of assigned material). Low impact assignments 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. The purpose of these low impact assignments is to allow students to think about particular issues without the pressure of grades.

* Included in the % of your grade for Low Impact Assignments is CLASS PARTICIPATION

**Tardiness in handing in assignments and labs:**
Lab grades will be penalized for lateness, and reading questions will not be accepted at all.

**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.

**HELPFUL INFORMATION**
**My Teaching Philosophy:** My goal in teaching is to help students in becoming confident and responsible professionals and to make this experience an enjoyable one. My approach to teaching involves being a facilitator in the learning process as opposed to being the authoritarian lecturer at the front of the room with a "one-way information transfer" style. I understand and respect individual differences in learning and do my best to promote learning in the classroom by working with individual differences rather than against them. At the same time, I wish to impart technical skills and a sense of responsibility by encouraging students to play the role of professionals in the classroom.

I expect students to put their best effort in this course. This involves participating in the in-class exercises, reading the assigned material, doing the homework, editing when necessary until they are clear and correct, and preparing for quizzes and exams.

**Lecture:** I will spend part of the lecture time explaining the key concepts of earth systems and earth science and discuss, when appropriate, solution of problems. You are expected to devote time outside the classroom to understand the concepts, and review questions given at the end of chapters in the textbook, or questions that I may ask in class. I expect that lectures will give you a clear idea of what is expected in quizzes and exams.

**Finally**: It is important to start with a good study habit. Consistency is the key. Forming study groups is extremely helpful. Use my time and any resource available to you throughout the semester. Make progress steadily as the material in this course cannot be understood the night before the exam. Concentrate on understanding rather than 'regurgitating'. Put out your best effort everyday!

The following are useful tips to do well in this or any class:

- Attend class and take detailed notes.
- Read the assigned material in the text (or other) ***before*** coming to class.
- Re-write your notes as soon as possible after class. This will allow you to fill in the details still fresh in your memory, and prepare questions for the next time the class meets.
- Test yourself by answering the questions in the book and in class.
- Carefully study the diagrams and charts in the book and in the lectures.

**As with all courses at Hunter College:**

**Academic Dishonesty:** Please be advised that plagiarism, dishonesty, or cheating in any portion of the work required for this course will be punished to the full extent allowed according to Hunter College regulations.

> **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, located in Room E1214B, to secure necessary academic accommodations. For further information and assistance, please call: (212) 772- 4857 or (212) 650-3230.

## Chapter Titles for Second and Third editions of text book

Titles listed in red are different for the two editions

PG250 (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. |

## Pgeog 250 – ESSI, Fall 2012: COURSE SCHEDULE *** Tentative Schedule (subject to change) ****

chapters and page numbers refer to textbook by Kump, Kasting, and Crane 3rd edition, unless otherwise specified.
B&M refers to chapters from Bowler and Morus, which will be provided to you. LI = Low Impact.

| Class # | Date | Day | Lectures | Required Reading/Assignment ** Due TODAY ** | Tuesday Lab Section 001 | Friday Lab Section 002 |
|---|---|---|---|---|---|---|
| 1 | 8/28 | Tu | Introductory lecture, **Ch. 1 – Global Change** | | **Lab 1. Introduction to EXCEL, Basic algebra review (LI)** | |
| 2 | 8/31 | Fri | Ch. 1 (continued) | Ch. 1 – Global Change | | **Lab 1. Introduction to EXCEL, Basic algebra review (LI)** |
| 3 | 9/4 | Tu | **Ch. 3 – Global Energy Balance** | Ch. 3 – Radiation Balance | **Lab 2. Scientific notation, working with units (LI)** | |
| 4 | 9/7 | Fri | Ch. 3 (continued) | Ch. 3 – Planetary Energy Balance | | **Lab 2. Scientific notation, working with units (LI)** |
| 5 | 9/11 | Tu | Ch. 3 (continued) | Ch. 3 – Effect of clouds. Climate Feedbacks | **Lab 3. Earth (*) Radiation Balance** | |
| 6 | 9/14 | Fri | **Ch. 2 – Systems Thinking** | Ch. 2 – Systems Approach | | **Lab 3. Earth Radiation Balance** |
| | **9/18** | **Tu** | **No Classes Scheduled** | **No Classes Scheduled** | **No Classes Scheduled** | **No Classes Scheduled** |
| 7 | 9/21 | Fri | Ch. 2 (continued) | Ch. 2 – Daisyworld climate system | (*) Students need to find time to continue Lab 3 other than on Tuesdays! | Lab 3 (continued) |
| | **9/25** | **Tu** | **No Classes Scheduled** | **No Classes Scheduled** | **No Classes Scheduled** | **No Classes Scheduled** |
| 8 | 9/28 | Fri | ***Review midterm 1*** | B&M ch. 21 – Science and Gender – Prepare discussion ***LI assignment #1- due 10/12*** | (*) Students need to find time to continue Lab 3 other than on Tuesdays! | **Lab 4: Daisyworld** |
| **9** | **10/2** | **Tu** | **Midterm 1. Chapters 1-3** | | **Lab 4: Daisyworld** | |
| 10 | 10/5 | Fri | **Ch. 4 – The Atmosphere** | Ch. 4 – Global circulation | | Lab 4 (continued) |
| 11 | 10/9 | Tu | Ch. 4. (continued) | Ch. 4 – Forces. Temperature distribution | Lab 4 (continued) | |
| 12 | 10/12 | Fri | Ch. 4. (continued) | Ch. 4 – Precipitation patterns **LI assignment #1- due TODAY** | | **Lab 5. Geometric progressions and growth. Exponential and logarithmic functions** |
| 13 | 10/16 | Tu | Ch.4 (continued) | Ch. 4 – Finish chapter | **Lab 5. Geometric progressions and growth. Exponential and logarithmic functions** | |
| 14 | 10/19 | Fri | **Ch. 5 – The** | Ch. 5 – Surface currents | | Lab 5 (continued) |

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| | | | **Oceans** | | | |
| 15 | 10/23 | Tu | Ch. 5 (continued) | Ch. 5 – Boundary currents | Lab 5 (continued) | |
| 16 | 10/26 | Fri | Ch. 5 (continued) | Ch. 5 – ENSO | | **Lab 6. Thermal Damping, response times, seasons** |
| 17 | 10/30 | Tu | **Ch. 6 – Modeling the Atmosphere Ocean System *From 2nd Edition*** | Ch. 6 – Numerical models | **Lab 6. Thermal Damping, response times, seasons** | |
| 18 | 11/2 | Fri | Ch. 6 (continued) | Ch. 6 – GCMs and their use | | Lab 6 (continued) |
| 19 | 11/6 | Tu | ***Review midterm 2*** | **Prepare Questions!** | Lab 6 (continued) | |
| 20 | 11/9 | Fri | **Midterm 2. Chapters 4, 5, 6** | | | **Lab 7. Solving Problems in Earth Science** |
| 21 | 11/13 | Tu | **Ch. 7 – The Solid Earth** | Ch. 7 – Anatomy of Earth | **Lab 7. Solving Problems in Earth Science** | |
| 22 | 11/16 | Fri | Ch. 7 (continued) | **LI2 – TBD**<br>***LI assignment #2- due 12/7***<br>Ch. 7 – Plate Tectonics | | **Lab 8. The Carbon Cycle** |
| 23 | 11/20 | Tu | **Ch. 8 – The Carbon Cycle** | Ch. 8 – Systems approach to C cycle | **Lab 8. The Carbon Cycle** | |
| | **11/23** | **Fri** | **NO CLASS (Thanksgiving)** | **NO CLASS (Thanksgiving)** | **NO CLASS (Thanksgiving)** | **NO CLASS (Thanksgiving)** |
| 24 | 11/27 | Tu | Ch. 8 (continued) | Ch. 8 – Long-term organic C cycle | Lab 8 (continued) | |
| 26 | 11/30 | Fri | Ch. 8 (continued) | Ch. 8 – The C-Si geochemical cycle | | Lab 8 (continued) |
| 27 | 12/4 | Tu | Ch. 8 (continued) | Ch. 8 – Finish chapter | **Lab 8 due TODAY** | |
| 28 | 12/7 | Fri | General Discussion on the Nature of Science | **LI assignment #2 – due TODAY** | | **Lab 8 due TODAY** |
| 29 | 12/11 | Tu | ***Review for Final Exam*** | **Prepare Questions** | | |
| **FINAL EXAM** | **12/18** | **TU** | **9:00 – 11:00 am** | **Final Exam – Ch …..** | | |