PGEOG 25000 – Fall 2019
EARTH SYSTEMS SCIENCE I
COURSE INFORMATION AND OBJECTIVES
Lecture Instructor: Professor Haydee Salmun
Lab Instructor: Mr. Rahul Sahajpal
Revised 08/08/2019

CLASS SCHEDULE:
LECTURES: Tuesday/Friday, 11:10 AM – 12:25 PM, Room 1022 Hunter North
LABS: Section 1: Tuesday, 12:45 PM – 1:35 PM, Room 1090B Hunter North
Section 2: Tuesday, 12:45 PM – 1:45 PM, Room 1090B Hunter North

PROFESSOR SALMUN CONTACT INFORMATION:
Office Department of Geography and Environmental Science, Room1035 HN
E-mail hsalmun@hunter.cuny.edu (*)
Tel. 212-772-5224
Office Hours: Tuesday/Friday, 1:00 PM – 2:00 PM, ***please make an appointment***

Prof. SAHAJPAL CONTACT INFORMATION:
Office Geography Department, Room 1032 Hunter North
E-mail Rahul.Sahajpal51@myhunter.cuny.edu (*)
Office Hours: ***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 emails 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 AND 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.

Broad Course Objectives

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
Overall, at the end of the semester students would have acquire theoretical and practical tools to explore the processes active on Earth's surface and interior, and how these processes work together to determine and regulate Earth's climate, the circulation of the atmosphere and ocean and the recycling of elements. In addition, students will have become aware of the convincing observational data that are used by scientists to study global change and of the events in Earth's history that illuminate how the Earth as a **system** responds to stress.

1. *Theory*
At the end of the semester, students would be expected to

- describe and calculate the Earth's energy balance
- describe the circulation and properties of the solid and fluid components of the Earth System
- explain how various Earth processes function together to determine and regulate Earth's climate
- describe the role of the carbon cycle in the Earth's climate system.
- experience how these processes are incorporated into numerical models to investigate how the Earth system may respond to a given forcing

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 or/and other similar modeling 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 and the use of computer simulations, or models, to understand the earth from a "systems dynamics" perspective. STELLA® modeling software (or/and similar) 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 TWO weeks. Labs are expected to be emailed to the lab instructor before the beginning of the next lab.

Group work – is allowed for labs and assignments when specified by the instructor. Discussions and consultations are allowed but the final 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, preferably an Earth Science basic course, such as Weather and Climate, Introduction to Oceanography, or Introduction to Geology, 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, 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 posted on the new online Hunter Bookstore.

Bryson, Bill, *A Short History of Nearly Everything*, Broadway Books, 2004,
ISBN10: 076790818X

* See table at the end of this file for outline of differences between the two editions

ADDITIONAL READINGS AND LAB MATERIAL will be provided, including lab exercises that have been designed specifically for this course.

GRADES
Grades are based on lab work, two midterm exams, one final exam, and assignments and class participation as detailed below:

Labs	30%
Exams	50% (2 midterms (@15%e each) and a final (@20%)
Assignments+Class Participation	20% (approximately @10% each)

ASSIGNMENTS
Group work is encouraged. Assignments will not be accepted late. If you experience extenuating circumstances, you must contact me within 24 hours of the due date of the assignment to discuss course of action.

Assignments must be submitted electronically (to email provided). A hard copy will be accepted but electronic copies are highly recommended.

When submitting your assignments electronically, the document name must have the following format:

lastname_firstname_assignmentname_pgeog250.docx (.pdf)

Examples:
haydee_salmun_HW#1_pgeog250.docx
salmun_Assig#1_pgeog250.docx

This naming rubric helps me keep track of student work. If you do not name your documents as specified above, I do not guarantee that they will be graded or/and lost, or/and overwritten.

In addition, within the document itself, you must include your full name, assignment title and any other students with whom you worked. All work must be presented in a clear and professional manner. If I cannot read it, I cannot grade it.

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.

Exams are designed to evaluate a student's ability to master content, integrate themes and concepts among sub-disciplines in Earth Science, understand the usefulness and limitations of data for studying processes, and apply logical arguments in support of concepts, theories, new developments and perspectives in Earth Science.

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. A detailed description of the Hunter College Grading System may be found at https://ww2.hunter.cuny.edu/students/academic-planning/degree-requirements/construct-an-academic-plan/gpa-calculator/grading-scale.

b. Examinations are 1 hour and 15 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. No electronic devices or reference materials will be permitted on the desk during exams unless specified.

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 plus exams). Students on probation are not eligible for this option. Students are welcomed to discuss this option with me before the final exam. For more information about Hunter College's CR/NCR policy got to: http://www.hunter.cuny.edu/advising/howto/file-credit-no-credit-cr-nc

PARTICIPATION AND CLASSROOM POLICIES

Class participation constitutes 10% of the final grade. Attendance is strongly encouraged at all lectures because students who do not attend lecture cannot participate in class discussions.

You are expected to have read the reading listed for each class day *before class on that date*. Texting and other non-class related smart phone activities are not allowed. Students should quietly excuse themselves from the lecture if substantial external electronic communication is required. All phones must be silenced. Laptops (and other tablets) are not necessary and will not be permitted in class. Special considerations will be given in exceptional cases, in which case permission to use laptop has to be obtained from the instructor.

SYLLABUS CHANGE POLICY

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.

The professor reserves the right to alter or add topics and assignments as needed.

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 & 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:

As per CUNY, an **Unofficial Withdraw (WU)** is assigned to students who **attended a minimum of one class**. It is important to understand the definition of a WU and the difference between this grade and an F grade. The conditions for assigning the WU grade include:

1. A student's enrollment has been verified by the course instructor, and
2. The student has severed all ties with the course at any time before the final exam week and, consequently, has failed to complete enough course work -- as specified in the course syllabus -- to earn a letter grade, and
3. The student has not officially withdrawn from the course by completing the process for a W grade, or made arrangements to receive an INC.

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.

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.

HUNTER COLLEGE POLICY ON SEXUAL MISCONDUCT

In compliance with the CUNY Policy on Sexual Misconduct, Hunter College affirms the prohibition of any sexual misconduct, which includes sexual violence, sexual harassment, and gender-biased harassment retaliation against student, employees, or visitors, as well as certain intimate relationship. Students who have experienced any form of sexual violence on or off campus (including CUNY-sponsored trips and events) are entitled to the rights outlined in the Bill of Rights for Hunter College.

A. *Sexual violence*: students are strongly encouraged to immediately report the incident by calling 911, contacting NYPD Special Victims Division Hotline (646-610-7272) or their local police precinct, or contacting the College's Public Safety Office (212-772-4444)

B. *All other forms of sexual misconduct*: Students are strongly encouraged to contact the College's Title IX Campus Coordinator, Dean Jean Rose (jtrose@hunter.cuny.edu or 212-650-3262) or Colleen Barry (colleen.barry@hunter.cuny.edu or 212-772-4534) and seek complementary services through the Counseling and Wellness services Office, Hunter East 1123.

CUNY Policy on Sexual Misconduct Link:
http://www.cuny.edu/about/administration/offices/la/policy-on-sexual-misconduct-12-1-14-with-link.pdf

** A tentative schedule of classes, topics and reading assignments is provided below and will be updated on BlackBoard as needed **

PGEOG 25000 – Fall 2019 (ESSI)
Additional Information

Chapter Titles for Second and Third editions of text book

Titles listed in red are different for the two editions

PGEOG25000 (ESSI) 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 25000 – ESSI, Fall 2019: COURSE SCHEDULE

***** Tentative Schedule (subject to change) *****

Readings refer to textbook by Kump, Kasting, and Crane 3rd edition; "Bryson" refers to "A Brief History of Nearly Everything"

Class No & Date	Lecture Subjects	Reading	Labs	Assign Due	Bryson Chapter
1. Tue – 8/27	Introduction	Ch. 1 – Global Change	lab 1		
2. Fri – 8/30	Global Change	Ch. 1 – Time Scales			4
3. Tue – 9/3	Global Energy Balance	Ch. 3 – Radiation Physics	lab 2		
4. Fri – 9/6	Atmospheric Structure	Ch. 3 – Planetary Energy Balance			5
5. Tue – 9/10	Greenhouse Effect	Ch. 3 – Physics of Greenhouse Effect. Climate Feedbacks	lab 2		
6. Fri – 9/13	Basic Climate Modeling	Ch. 3 – Clouds, feedbacks		HW#1	6
7. Tue – 9/17	The Systems Approach	Ch. 2 – Systems Approach	lab 3		
8. Fri – 9/20	Feedbacks. Forcing.	Ch. 2 – Daisyworld climate system			7
9. Tue - 9/24	**Review**	Review Ch. 1-3 & bring questions!	lab 3		
10. Fri – 9/27	**Midterm 1. Chapters 1-3**				8
Tue – 10/1	**No Classes Scheduled**				
11. Fri – 10/4	The Atmosphere	Ch. 4 – Global circulation			9
Tue – 10/8	**No Classes Scheduled**				
12. Fri – 10/11	Atmospheric Circulation	Ch. 4 – Global Patterns. Precipitation		HW#2	12
13. Tue – 10/15	Hurricanes	Ch. 4 – Finish chapter	lab 4		
14. Fri – 10/18	The Oceans	Ch. 5 – Surface currents			13
15. Tue – 10/22		Ch. 5 – Deep Ocean Circulation	lab 4		
16. Fri – 10/25		Ch. 5 – ENSO			14
17. Tue – 10/29	The Cryosphere	Ch. 6 – Sea Ice & Climate	lab 5		
18. Fri – 11/1	Arctic and Antarctic	The Southern Ocean (reading will be posted)		HW#3	15
19. Tue – 11/5	**Review**	**Prepare Questions!**	lab 6		
20. Fri – 11/8	**Midterm 2. Chapters 4, 5, 6**				16
21. Tue – 11/12	The Solid Earth	Ch. 7 – Anatomy of Earth	lab 7		
22. Fri – 11/15	Physiology of Solid Earth	Ch. 7 – Plate Tectonics. The Rock Cycle.			17
23. Tue – 11/19	The Carbon Cycle	Ch. 8 – Systems approach to C cycle	lab 7		
24. Fri – 11/21	Short Term Cycle	Ch. 8 – Short-term organic C cycle**;** the biological pump		HW#4	18

25. Tue – 11/26	Long Term Cycle	Ch. 8 – Carbon and Oxygen	lab 8		
Thanksgiving Break 11/28 – 11/30 – College Closed					
26. Tue– 12/3	Inorganic Carbon	Ch. 8 – Long-term organic C cycle	lab 8		19
27. Fri – 12/6	Links between organic & inorganic C	Chapter 8 – Finish the chapter.			
28. Tue– 12/10	**Review for Final Exam**	**Come to class prepared to ask questions!**	lab 8	HW#5	
Friday 12/13 – Reading Day					
FINAL EXAM: 17 December; 9:00 am – 11:00 am **NOTE: focus of final exam is material discussed since Midterm Exam II**					