

## **ES 107 – Climate and Earth Systems Science**

Syllabus – Spring 2017

**Instructor: Diane Thompson**

Office: [CAS 141E](#)

Email: [thomsod@bu.edu](mailto:thomsod@bu.edu)

Office Hours: W 2:30-3:30 PM

Office Phone: (617) 358-0120

### Class Meeting:

Lecture: MWF 1:25-2:15 [COM 101](#)

Lab: Section B1 M 2:30-4:15 pm [CAS B08A](#)

Section B2 T 9:00-10:45 am [CAS B08A](#)

Section B4 R 9:00-10:45 am [CAS B08A](#)

Section BA W 10:10-11:55 am [CAS B08A](#)

Section BB R 1:30-3:15 pm [CAS B08A](#)

Section BC W 4:30-6:15 pm [CAS B08A](#)

### **TFs:**

**Emma Reed** ([evreed@bu.edu](mailto:evreed@bu.edu))

Office Hours:

Tuesdays 2:00-3:00 PM

Location [CAS B33](#)

**Catherine Scott** ([scottcb@bu.edu](mailto:scottcb@bu.edu))

Office Hours:

Thursdays 3:30-4:30 PM

Location [STO 351C](#)

**LAs:** Elise Liu, Hannah Pangrcic, Kaveesh Nair G Sudhakara  
([eliseliu@bu.edu](mailto:eliseliu@bu.edu), [hjp458@bu.edu](mailto:hjp458@bu.edu), [kaveesh@bu.edu](mailto:kaveesh@bu.edu))

### **Course Description:**

Earth is a remarkable, complex, and ever-changing planet. The rise of humans is a relatively recent event in Earth history, but in the short time we have been here, humans have heavily altered many aspects of our planet. As the global population grows to between nine and thirteen billion people by the end of the 21<sup>st</sup> Century, never has it been more important for society to understand how the Earth's climate, oceans, and terrestrial ecosystems function as an integrated system that supports life and society as we know it. The goal of this course is provide an integrated and systematic understanding of how the natural and physical systems of Planet Earth function. The course treats the Earth as a dynamic system, comprised of interacting sub-systems (oceans, atmosphere, biosphere, lithosphere, etc.) that exhibit properties of internal feedback regulation and stability. A core theme of the course is that change and variability are core properties of the Earth system that arise from complex interactions among its physical and biogeochemical subsystems. As part of this, we will explore how human activities alter the fundamental properties of the Earth system. Laboratory exercises will examine Earth system processes at both local and global scales, and will focus on local, regional and global processes to illustrate concepts discussed in lecture. This course serves as a foundation for the CAS major in Earth and Environmental Science, and as a natural science divisional studies elective.

**Prerequisites:** None

**Course materials:**

**Text, Required:** The Earth System, 3<sup>rd</sup> Edition, by Lee R. Kump, James F. Kasting, Robert G. Crane ISBN-10: 0321597796 • ISBN-13: 9780321597793, 2010, Prentice Hall, 432 pp.

**Supplemental readings:** Supplemental reading will be distributed electronically. These may include text from:

- Laboratory Manual in Physical Geology, Busch and Tasa, selections from Ch 4, 9 & 10
- Introduction to Environmental Geology, Keller, selections from Ch 6, 9 & 11
- Humidity, Condensation, Precipitation, Ch 6 in *Physical Geography*, Petersen and Sack
- FAQs from the IPCC Fifth Assessment Report: <http://www.ipcc.ch/>

**Lab Assignments:** There is no lab text. *Students are responsible for completing lab reading and quiz posted on blackboard before their section meeting.*

**Class and Lab materials, provided by student:**

Scientific calculator (can use phone for labs but NOT for exams!), ruler, access to a web-accessible computer with Word, Excel, Adobe Reader

**Classroom conduct:**

**Attendance Policy:** Students are expected to attend each scheduled class and lab meeting, to be on time, and to be prepared for each class session. *There will be no make-ups for in class activities.*

Students are required to attend their scheduled lab section each week. Many labs will include significant setup and prep, and make-ups will be difficult if not impossible. Decisions on make-up labs will be at the discretion of the TF. In the event that the student must be absent from class activity or lab, the student is responsible for contacting the Professor or TF as soon as possible before the missed class to make arrangements. *Arrangements to make up work cannot be guaranteed if the instructor is not contacted prior to the absence.*

**Cell Phones and Laptops:** Please respect the learning environment of your classmates and turn your cell phones off or on silent during class. In addition, please respect the time dedicated to you in the classroom by not texting or accessing the internet / social media during class. Some modules in this class may utilize laptop computers and smart phone apps – please restrict your use of these to the assignment.

**Communication – Blackboard**

I will rely on Blackboard to send course email announcements, updates to assignments, Labs, data etc. Please be sure you check Blackboard regularly or set up notifications. If you are having any problems receiving and sending communications through Blackboard, or having difficulty accessing course materials, please let me know.

Information about Blackboard at BU can be obtained here:

<http://www.bu.edu/tech/services/teaching/lms/blackboard/students/>

**Assessment:**

Lab Assignments:	30%	Exam 1:	20%
Exam 2:	20%	Final Exam:	20%
Class participation/ homework / quizzes: 10-13%			

**Labs:** Labs will be completed during you assigned section meeting and will be due at the beginning of lab the following week. Lab work will often be completed in groups, but unless otherwise directed, everyone must submit their own work and clearly show any calculations. Full credit may not be given if your work cannot be clearly followed. Please see lab syllabus for further details. *You must obtain a passing grade in lab to pass this class.*

**Exams:** Two required exams will be administered during the semester. You are required to complete exams during the assigned period. If there is a conflict or illness, you are required to contact the professor *in advance* of the exam. *A make-up exam cannot be guaranteed if the professor is contacted after the exam period has passed.*

**Exam 1: Fri Feb 24** Comprehensive exam based on readings in text, class lectures, discussions, exercises, activities and concepts reinforced in lab. Covers material from the first class to the class before Exam 1.

**Exam 2: Fri April 7** Comprehensive exam based on readings in text, class lectures, discussions, exercises, activities and concepts reinforced in lab. Covers material from the first class after Exam 1 to the class before Exam 2.

**Final exam: TBD** Cumulative exam based on readings in text, class lectures, discussions, exercises, activities and concepts reinforced in lab. Covers material from the entire semester. All class content will be integrated, but approximately 2/3 will be on material covered in Exams 1 and 2, and 1/3 from material covered following Exam 2.

**Class participation/ homework / quizzes:** Over the course of the semester, you will need to earn 30 points toward this grade to earn a full 10%. You can earn additional points by completing a number of optional assignments; these percentage points will count toward extra credit on your final class grade (up to a maximum of 13%). Points will be accrued by doing the following:

Required: (*you must complete these assignments*)

- (5 pts each) Quiz 1 and Quiz 2
- (5 pts) IMAX movie assignment
- (5 pts) submission of Science Friday exercise
- (~15 pts) submission of a weekly class survey question, 1 pt ea.

Optional: (*choose from below to complete your 30+ points*)

- (5pts) give a 5 min presentation on your science Friday topic to the class

- (5 pts each) choose from three optional homework assignments
- (1 pt each) attend an Earth & Environ. Depart. graduate student talk (Fridays at 12-1, CAS rm 132) or defense (as scheduled)

Partial credit: For all assignments and exams, partial credit will be given based on the level of completion and correctness. For problems that require calculations, *full credit will not be given if the appropriate supporting work and units are not clearly shown.*

Extra Credit: no extra credit will be given to an individual that is not given to the entire class. (see “Class Participation” for extra credit opportunities)

**Late Policy:**

- Assignments are due at the beginning of class unless otherwise stated.
- Late penalty: 10% deduction per day late. If extenuating circumstances arise and you need an extension, you must arrange this with the Professor or Lab TF prior to the original lab due date. Otherwise the full deduction will be taken.
- Assignments cannot be turned in for credit after the exercise has been graded and returned to the class.

Grades will be based on the following points/ percentages:

<u>Percentage</u>	<u>Letter</u>	<u>GPA</u>
93-100	A	4.0
90-93	A-	3.7
87-90	B+	3.3
83-87	B	3.0
80-83	B-	2.7
77-80	C+	2.3
73-77	C	2.0
70-73	C-	1.7
60-69	D	1.0
< 60	F	0.00

**Academic integrity:**

- The College of Arts and Sciences policies on incomplete grades and academic conduct will be followed. For details refer to the BU undergraduate or graduate bulletins and the CAS Academic Conduct Code, at <http://www.bu.edu/academics/policies/academic-conduct-code/>.
- Many activities and labs will include collaborating in groups; however, unless explicitly stated otherwise, each group member must submit their own unique work. Duplication of other group members’ work will be considered cheating.
- For written assignments, any information presented from an outside source (books, news papers, online sources) must be cited appropriately. Paraphrasing without citation will be considered plagiarism.
- Infractions will be handled in accordance with university policy, and can result in a zero for the assignment, or reduction in course grade.

**Disability Accommodations:** Accommodations for students with disabilities will be

provided in accordance with the policies of Boston University.

**BU resources:**

1. BU Academic Conduct Code: <http://www.bu.edu/academics/policies/academic-conduct-code/>
2. BU Policy on Religious Observance: <http://www.bu.edu/chapel/religion/>
3. Multifaith Calendar: <http://www.interfaithcalendar.org/>

**ES 107 Course Schedule Jan 19 2017 (Tentative, subject to change)**

Week	Day/ Date	Topics	Reading (Kump, or Keller)	Lab topic	Lab Reading
<b>Week 1</b>	Jan 20	Introduction/ Systems	Ch 1, 2	<b>No lab</b>	
<b>Week 2</b>	Jan 23, 25, 27	Systems/graphs/Daisyworld/Energy Balance	Ch 1, 2, 3	<b>No lab</b>	Lab 1 Reading
<b>Week 3</b>	Jan 30, Feb 1, Feb 3	Atmosphere structure, gas laws, circulation, Clouds, precipitation	Ch 4, Peterson Ch6	<b>Lab 1 Daisy world/ Energy</b> (Energy calc; Greenhouse Gas exercise)	Lab 2 Reading, Kump p 58-68
	Feb 4/5	IMAX: Extreme Weather			
<b>Week 4</b>	Feb 6, 8, 10	Oceans structure, wind/thermo-haline circulation, ocean heat capacity <b>Quiz 1</b>	Ch 5	<b>Lab 2</b> Atmospheric circulation	Lab 3 Reading, Kump p 84-89 & 96-105
<b>Week 5</b>	Feb 13, 15, 17	Cryosphere, glacial processes; geomorph, soils.	Ch 6	<b>Lab 3</b> Ocean Circulation	
<b>Week 6</b>	Feb 20	<b>No Classes</b> <b>Columbus Day</b>			
MON CLASSES on TUE	Feb 21, 22	Earth Structure/ tectonics	Ch7 Busch Ch 4,9,10	<b>Lab 2</b> makeup (Thurs labs)	Lab 4 Reading, Kump p 122-126, Keller pg 170-172
	Feb 24	<b>EXAM 1</b>			
<b>Week 7</b>	Feb 27, Mar 1, Mar 3	Earth Structure/tectonics (cont), Rock cycle, geologic time	Ch7 Busch Ch 4,9,10;	<b>Lab 4</b> Tectonics/ earthquakes	Lab 5 Reading, Kump p 126-130 & 144-146; Busch Ch 4, 9, 10
<b>SPRING BREAK</b>	Mar 6- Mar 10				
<b>Week 8</b>	Mar 13, 15, 17	Earth Structure/tectonics, Rock cycle, geologic time (cont)	Ch7 Busch Ch 4,9,10;	<b>Lab 5</b> Earth History	Lab 6 Reading, Keller pg 300-301, 304-307
<b>Week 9</b>	Mar 20, 22, 24	Hydrologic cycle/ Rivers, Coastal processes, groundwater	Keller Ch 9 & 11	<b>Lab 6</b> River Processes	Lab 7 Reading, Keller pg 366-376, 378-380
<b>Week 10</b>	Mar 27, 29, 31	Biosphere, marine and terrestrial systems; Recycling of elements, C, N cycles ; <b>Quiz 3</b>	Ch 2,8, 9	<b>Lab 7</b> – Coastal processes	Lab 8 Reading, Kump p 170-173

<b>Week 11</b>	Apr 3, 5	Early Earth / Faint young sun, evolution of life, oceans, atmosphere  Co-evolution of solid earth, biosphere, atmosphere, hydrosphere through Earth history	Ch 10,11 Ch 12,13	<b>Lab 8</b> Carbon and nitrogen cycle lab	Lab 9 Reading, Kump pgs 273-276
	Apr 7	<b>Exam 2</b>			
<b>Week 12</b>	Apr 10,12, 14	Pleistocene glaciations; Isotopes	Ch 14	<b>Lab 9</b> Isotopes and paleo climate	
<b>Week 13</b>	Apr 17	No classes: Patriot's Day		<b>No labs</b>	
	Apr 19, 21	Recent Climate, climate change	Ch 15-18		Lab 10 Reading
<b>Week 14</b>	Apr 24, 26, 28	Climate Change (cont), Climate adaptation & Mitigation	Ch 15-18, IPCC TBD	<b>Lab 10: Climate Mitigation lab</b>	
<b>Week 15</b>	May 1	Climate mitigation student presentations		<b>No labs</b>	
	May 3	Wrap up			
<b>Final Exam - TBD</b>					

**ES 107 – Climate and Earth Systems Science**  
Professor Thompson  
Spring 2017

1 point – class participation

**Confirmation**

To receive a grade for this course and to ensure that you have read the entire syllabus and understand the course policies, please sign this form and return it in person at the end of the class by **Monday Jan 23, 2017**.

*I have read the syllabus for ES 107. I understand and agree to adhere to the policies explained in this syllabus.*

**Signature** \_\_\_\_\_ **Date** \_\_\_\_\_

**Name** \_\_\_\_\_  
(print full name)

**Name** \_\_\_\_\_  
(print preferred name / knick name)

**E-mail Address:** \_\_\_\_\_

**Picture:**