

GEO 106. EARTH SYSTEMS SCIENCE 2: CLIMATE CHANGE

COURSE DETAILS

Session:	Spring 2014	Classroom:	Filmore 170
Professor:	Prof. Chris Larsen	Office:	Wilkeson 124
Telephone:	645-0488	email:	larsen@buffalo.edu
Office hours:	Monday and Wednesday 12-1, or by appointment.		

COURSE OBJECTIVES

Climate change is in the news – high temperatures, low lake-levels, big storms, and growing deserts. Because climate change involves big stakes in terms of the environment, business, and politics, there are heated debates by vested interests in regards to how much of climatic change and extreme weather events are human-caused, and whether impacts will be severe enough to be worth avoiding.

Since climate change has been occurring naturally on Earth for its 4.6 billion year history, we will contextualize the current climate change by exploring how large have been past changes and what caused them to occur. We examine how the Earth operates as a system, how without the natural greenhouse effect Earth would have no life, and how the evolution of life and caused large climate changes. We then explore how humans influence many of those natural processes and thus influence climate change. Finally, we examine how future climate change is predicted, how much change is predicted, how it may modify things like food production, and how technology may reduce changes.

SUGGESTED MATERIALS

Kump, L., J.F. Kasting and R.G. Crane. 2009. *The Earth System*, 3rd Edition. Prentice-Hall. It is available at the bookstore, Amazon.com, Greek and Sneaks (buys back at 50%), and as an eBook from CourseSmart (www.coursesmart.com) using an ISBN of 0321681258.

We will be using TurningTechnologies' Clickers, available from the textbook store. Models NXT, RF and XR are all acceptable. You must register your Clicker through our *UBlearns* site. We will typically use Clickers five times per lecture to develop active learning and to assess your understanding of the lecture.

LECTURES

The lectures consist of material from the text that I think is most important, with supplementary information from other sources. The text of the lecture will be posted on *UBlearns* prior to the lecture and will remain there until the exam has been given. It is a very good idea, however, for you to write some notes and draw the diagrams during the lecture to keep your brain actively engaged with the lecture. Indeed, none of the figures, photos or tables will be posted, and so you will need to draw them. Figures and tables from your textbook will be identified, so if you have the textbook then you will not have to draw them. In the written notes, some ideas and numbers will be enclosed by square brackets like these [0.06]. Such ideas and numbers are provided to help you understand key ideas, but they will NOT be part of an exam question.

I encourage you to ask questions in class. However, out of respect for your classmates, it is required that you be quiet during class except when asking questions. If you arrive late or leave early, please use the doors at the rear of the class and sit on the edge of a row. Otherwise, please sit at the center of a row so that latecomers won't have to walk in front of you.

CLICKERS

We will use Clickers, created by TurningTechnologies, at least 5X times per lecture, to develop active learning and to assess your understanding of the lecture. You can purchase a Clicker for approximately \$54 new at the bookstore or online. I do NOT use ResponseWare because of frequent problems with reception in this room. You must register your Clicker through the UBlearns site for our course. For information on Clickers and their registration, go to: <http://www.buffalo.edu/ubit/service-guides/teaching-technology/learning-resources-for-students/ubclicks.html>.

If you do not register your Clicker, then you will not receive the Clicker scores generated by your use of the Clicker. If you change the Clicker you use during the semester, you must alert Prof. Larsen so he can merge your new Clicker with your existing Clicker scores.

ACADEMIC INTEGRITY POLICY

Plagiarism, broadly defined, is representing the work of someone else as your own work. A first case of plagiarism will result in the student being given a score of zero on that lab or exam. If your first case is being caught using someone else's Clicker, then you will both have 4 percentage points removed from your exam average in the course (e.g. you would drop from a 52% to a 48% average). A second case of plagiarism, whether it is in the labs, with Clickers, or on an exam, will result in you failing the course.

COURSE EVALUATION

Final Course Grade

To pass this course you must obtain a minimum average of 50.0% (D) on the ten labs, **AND** a minimum average of 50.0% (D) on the four exams. If you pass the exams but fail the labs, or pass the labs but fail the exams, then you will be given an F in the course. There are no exceptions.

The 4 exams are worth at least 60%, the labs are worth 24%, and the clicker questions are worth at most 16% (0.5% per lecture) of your final mark. Your Clicker scores will only be used for the classes in which you used your Clicker, and if your Clicker average for the semester (not including days that your Clicker was not used) was higher than your exam average. Thus, if you attended all 32 classes and your Clicker average was higher than your exam average, then the exams would be worth 60% and the Clicker scores would be worth 16%. If you did not use a Clicker in any of the classes, then the exams would be worth 76%. If you used a Clicker in 20 of the classes and the average of those 20 scores was higher than your exam average, then your Clicker score would be worth 10% and your exams would be worth 66%.

Note: last year the average Clicker score was 88% and the average exam score was 70%; thus, attending the lectures and using the Clickers will help your grade.

The percentages are converted to a letter grade using the following grading scheme:

$\geq 85.0\% = A$	$\geq 76.6\% = B+$	$\geq 66.6\% = C+$	$\geq 55\% = D+$
$\geq 80.0\% = A-$	$\geq 73.3\% = B$	$\geq 63.3\% = C$	$\geq 50\% = D$
	$\geq 70.0\% = B-$	$\geq 60.0\% = C-$	$< 50\% = F$

Clickers

Clickers will be used to promote active learning and for immediate assessment of learning during each lecture. Your Clicker responses are worth up to 16% of your final course grade (0.5% per lecture X 32 lectures). You will be graded using two types of Clicker questions, with the type noted above the question. First, if it is an information gathering question, then you will receive a mark for any response. Second, if it is an information recall question, then you only receive a mark for the correct response.

Exams

There are 4 non-cumulative exams worth a minimum of 60%, and a maximum of 76%, of your final course mark. Each exam is worth at least 15% (and up to 19%) of your course mark. The fewer days you use your Clicker, the more your exam scores will count towards your final course grade.

Each exam contains five questions per lecture (one question from each 1/5 of the lecture), for a total of 40 questions. You must show picture ID (e.g. UB Card) when you hand in your exam. You will only be tested on material in the lecture notes that are given online. However, if material that was not in the notes was added in the lecture, and Prof. Larsen explicitly told you to add to your notes, then you will also be expected to know it for the exam. If material in the online notes was not presented in the lecture due to time constraints, it will still be required for the exam. No other material from the text or from the labs will be on the exams. Some suggested study methods are given on the last page of this syllabus.

While writing the exam you must keep both hands on top of the desk, to ensure that you are not looking at notes or electronic media in your lap. If you are seen handling any electronic device during the exam then you will automatically be given a mark of zero for that exam. You are NOT allowed to leave an exam to visit the restroom, as students have used that to enable checking notes outside the classroom. There will NOT be a final exam in this course. However, the scheduled final exam period will be used for make-up exams for people without documentable excuses for missing an exam.

Labs

The labs allow you to explore ideas related to science and climate change. Each of the ten labs counts 2.4% towards your final course mark, for a total of 24%. You MUST attend YOUR scheduled lab-time to obtain marks for the lab handed out that week. Instructions regarding lab attendance and marking are given in the first week of labs (Feb. 3 - 7); be sure to read them carefully. Pay special attention to parts about plagiarism as it can cause you to fail the course.

Missed Exams

If a student misses an exam they will be allowed to take a make-up exam. All responsibility for make-up exams resides with the student. Prof. Larsen reserves the right to refuse any and all documentation of illness or circumstance.

A student can do a multiple-choice make-up exam ONLY if they meet all three of the following criteria:

- i) the student contacts Prof. Larsen either before, or on the day of, the scheduled exam,
- ii) the student provides a note from the appropriate authority (e.g. medical doctor or police officer) or a document that substantiates your claim (e.g. your name mentioned in an obituary) is an absolute requirement for acceptance of your excuse. Notes from the UB Health Services Clinic are acceptable if you visit the day of the exam, and if it says you should not attend class.
- iii) the student does the make-up exam within two weeks of the missed exam. In the case of the fourth exam, they would have to write it during the scheduled final exam period.

If a student misses an exam but cannot meet all three of the above criteria, then their make-up exam will consist of two mandatory essay questions. These exams will all be administered in Fillmore 170 during the three-hour time final exam period scheduled by UB for this course: Monday, May 12, from 11:45 a.m. to 2:45 p.m. You MUST begin your exam at 11:45 a.m.; late arrivals will be given a "0". If you missed multiple exams, then they must all be written during this three-hour period. No exceptions to this time and date will be given. Failure to take a make-up exam on the prescribed date will result in a "0" grade for the exam.

GENERAL POLICIES

Extra Work

There is NO extra work. You have 4 exams, 10 assignments and 32 Clicker-days to show your abilities.

University Incomplete Policy

At Prof. Larsen's discretion, a grade of "Incomplete" can be given for the course if (1) the student has a passing average on the work that they have completed, and (2) there are extremely well documented extenuating circumstances for not being able to complete the course. If a grade of "Incomplete" is given, the student will be expected to attend and complete the course the next academic year. Additional information can be found at: <http://undergrad-catalog.buffalo.edu/policies/grading/explanation.shtml>.

Accessibility Resources

If you have a disability that limits your ability to opportunity to complete the course requirements, you must visit "Accessibility Resources" and provide them with official documentation as to your disability. They will assess the documentation and then advocate for you with Prof. Larsen so that you are given equal opportunity. For more information, consult: www.buffalo.edu/accessibility/self.php.

Classroom Disruption Policy

UB has a strong set of policies about student actions that disrupt the classroom and about the consequences for this: <http://undergrad-catalog.buffalo.edu/policies/course/obstruction.shtml>.

Distracting behavior has been found to not only lower the exam scores of the distractor by typically 5%, but actually lowers the exam scores of their neighbors by upwards of 10%.

Since distracting behavior has negative effects, this class has the following behavioral requirements:

- a) no talking while the professor is lecturing
- b) no eating during the lecture
- c) no use of cell phones, laptops or other electronic devices. If a laptop is used for taking notes, then it must only be used for that. Laughing and pointing your neighbor to the laptop is not acceptable.
- d) no reading of books, newspapers or other material during the lecture
- e) no walking behind or in front of the professor during lecture.

There is a three-step set of consequences to ignoring these behavioral expectations:

- 1) Prof. Larsen will warn you that you are being disruptive, and he will take your name and/or picture.
- 2) If you are disruptive again in any of the remaining lectures you will be told to leave the lecture, and you will need to contact UB's Office of Judicial Affairs and Student Advocacy using information from: <https://www.student-affairs.buffalo.edu/judicial/stuadvo.php>.
- 3) If you are disruptive a third time you will be resigned from GEO 106, and an "R" will be put on your transcript. If you are disruptive three times in one class, you will automatically be given an "R".

LECTURE SCHEDULE

This schedule may change due to unforeseen circumstances. If it does then you will be informed using the email address you entered into *UBlearns*. It is your responsibility to see and react to those emails.

<u>Date</u>	<u>Lecture Topic</u>	<u>Chapter</u>
Jan. 27	Course overview	Syllabus
Jan. 29	Global Change and the Need for Science	1
Jan. 31	An Introduction to Systems	2
Feb. 3		2
Feb. 5	Global Energy Balance: the Greenhouse Effect	3
Feb. 7		3
Feb. 10		3
Feb. 12	The Atmospheric Circulation System	4
Feb. 14	The Circulation of the Oceans	5
Feb. 17	Exam 1 (based on the 8 lectures from Jan. 29 to Feb. 14, inclusive)	
Feb. 19	Modeling the Atmosphere-Ocean System	15
Feb. 21	The Carbon Cycle	8
Feb. 24		8
Feb. 26		8
Feb. 28	Origin of the Earth and of Life	10
March 3		
March 5	Effects of life on the Atmosphere	11
March 7		
March 10	Exam 2 (based on the 8 lectures from Feb. 19 to March 7, inclusive)	
March 12	Long-Term Climate Regulation	12
March 14		12
March 17 - 21	Spring Recess – no classes	
March 24	Long-Term Climate Regulation	12
March 26		12
March 28	Pleistocene Glaciations	14
March 31		
April 2		
April 4	Global Warming, Part 1: recent and future climate	15
April 7, 9, 11	No classes – Prof. Larsen is away at a conference	
April 14	Exam 3 (based on the 8 lectures from March 12 to April 4, inclusive)	
April 16	Global Warming, Part 1: recent and future climate	15
April 18		15
April 21	Global Warming, Part 2: impacts, adaptation, mitigation	16
April 23		16
April 25		16
April 28		16
April 30		16
May 2		16
May 5	Exam 4 (based on the 8 lectures from April 16 to May 2, inclusive)	
May 7	Make-up class if Prof. Larsen had to cancel one class earlier in the semester	
May 9	Make-up class if Prof. Larsen had to cancel a second class earlier in the semester	

Exam 4 could thus take place as late as May 9.

LAB SCHEDULE

<u>Lab</u>	<u>Date</u>	<u>Lab Topic</u>
	Jan. 27 – 31	No labs during the first week because of Drop and Add – stay home!
1	Feb. 3 – 7	First week of labs
2	Feb. 10 – 14	
3	Feb. 17 - 21	
4	Feb. 24 – 28	
5	March 3 – 7	
6	March 10 – 14	
	March 17 – 21	No labs – Spring Break
7	March 24 – 28	
8	March 31 – April 4	
	April 7 – 11	No labs – TAs are away at a conference
9	April 14 – 18	
10	April 21 – 25	Last week of labs
	April 28 – May 2	Go to the lab to hand in lab 10, and get back lab 9
	May 5 – 9	Go to the lab to get back lab 10

<u>Lab</u>	<u>Day</u>	<u>Time</u>	<u>Location</u>	<u>T.A.</u>
A	Monday	12:00 – 1:50 pm	135 Wilkeson	Dameng Yin
C	Monday	2:00 – 3:50 pm	135 Wilkeson	Wei Yin
D	Monday	4:00 – 5:50 pm	135 Wilkeson	Wei Yin
B	Wednesday	12:00 – 1:50 pm	135 Wilkeson	Xiangyu Jiang
FF2	Wednesday	3:00 – 4:50 pm	135 Wilkeson	Xiangyu Jiang
FF1	Friday	12:00 – 1:50 pm	135 Wilkeson	Dameng Yin

<u>T.A.</u>	<u>email</u>
Xiangyu Jiang	xiangyuj@buffalo.edu
Dameng Yin	damengyi@buffalo.edu
Wei Yin	weiyin@buffalo.edu

STUDY METHODS FOR THE EXAMS

To remember long concepts, read through your notes slowly. If you read a concept that covers around 1/3 of a page, hide the section when you have finished reading it. Pause a few seconds. Repeat the concept over to yourself from memory. You do not have to repeat it back using the exact words in your notes. If you got part of it wrong, read the section again and then repeat it back to yourself again. When you have done that for all of the parts in a lecture, then use this same method to remember the names of the numbered and lettered sections in the lecture, as each lecture is usually one long concept.

Understanding of the material in the class does not involve passively reading your lecture notes, but instead involves actively reading and thinking about them using techniques such as the following four.

- a) comprehension: recognize the parts of an idea by remembering the hierarchical lecture structure.
- b) differentiation: identify ideas from different lectures that sound similar but mean different things.
- c) critique: recognize portions of your notes that are illogical or not detailed enough to understand.
- d) experience: relate the ideas to events and places that you have experienced.