EV 128: Introduction to Global Climate Change, Block 5, 2016

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Goals and Scope of the Course

The goal of this course is to give you a solid, scientific understanding of how the climate system operates and how and why climate change occurs. You will learn about climate from a whole-earth point of view that takes into account interactions between the atmosphere, terrestrial biosphere, cryosphere, and oceans.
A major focus of study will be current climate change and the impacts of climate change on ecosystems. In addition, we will consider historical climate change, natural climate variability, and the impacts of these changes on ancient societies and ecosystems. I expect you to leave this class better prepared to make day-to-day decisions based on sound understanding, accurate information, and reasonable conjectures, regardless of the exact career path that you take. You can expect to learn the following things:

- What the term 'climate' refers to and how it varies spatially
- What factors influence climate at any one place
- How climate impacts other aspects of the surface environment (e.g. processes of the terrestrial and marine hydrosphere, the atmosphere, and biosphere = 'critical zone') & the ability of humans to utilize this environment (e.g. live, farm or otherwise occupy it)
- What the possible causes of climate change are over time
- Examples of climate change in the past & our current 'climate context'
- How humans have responded to climate change in the past
- Climate change and associated impacts in the immediate future & possible human responses

Class Structure

Classes will begin at 9 AM and will involve a mix of lectures, labs, and discussions. There will be some lab activities that we will not be able to complete before 12 PM, I have noted these days on the schedule (see below). While you are not required to come to the afternoon session to finish the lab, I strongly encourage you to block out these times in your schedule so you can take advantage of the time *if* you need it.

In our sessions I will introduce new concepts, and we will usually do a few exercises during the day to reinforce these concepts. Every evening as a review you should do the assigned reading and make notes on anything that still confuses you. *Many evenings you will need to answer a question about the readings and/or material covered in class on canvas.* This serves multiple purposes: it provides me feedback on concepts you may be having trouble with, helps keep you engaged with the material outside of the classroom, and provides you a way to assess how you are doing (answering these questions will count towards your grade). Each morning we will go over any questions you have before going on to new material – so if you have a question, please ask! Keep in mind that study groups are a great way to learn and review the different concepts of climate! I encourage you to work with your classmates on all assignments, of course with the exception of exams.

Field Trips

In addition to the above activities, we will be going on a field trip – a 3-day trip to the Mountain Research Station at Niwot Ridge during week three of the block. You must sign up for the trip on Summit https://apps.ideal-logic.com/ccfieldstudy?key=29L66-D685_K9KH-5PTF_34033f4c
(link is also on Canvas) – sign the consent form and fill out the medical form. I will pass around a sign up for food in class. To find out more about Niwot Ridge and the Mountain Research Center check out their website: niwot.colorado.edu.

Office hours: I will have open office hours on Tuesdays and Thursdays in the afternoon (1:30 to 3:30). In most cases I will hold these office hours in our classroom or a computer lab, depending on what seems most

convenient given the work that day/week. I can of course meet with you outside of these times, just talk to me before/after class or email me to set up a time.

Attendance:
We will be covering a lot of material in this course, with every day building on the previous day. Therefore it is necessary that you show up for *every* class, with the exception of lab days marked as optional on the schedule. For any single *unexcused absence*, your overall course grade will drop 3%. If you have two unexcused absences, the Dean of Students will be notified. Please note that if you get sick during the block I will do everything I can to help you catch up on the material – but you *must* have a note from Boettcher or a doctor.

If you need to miss class for any justifiable reason during the block (e.g., athletic team travel, religious observance), please notify me **today** so we can make arrangements on how you will receive the material for that day.

Readings:
All readings are posted on Canvas. Please do the reading BEFORE class. You will be held accountable for the reading, so come to class prepared.

Canvas & Online Questions: I will use Canvas extensively throughout the course. I will do my best to have readings posted multiple days in advance. In addition, there will be questions posted that you must complete, these questions will be posted by 6 PM for the following day. The goals of these questions is for me to (1) assess your comprehension on material, (2) to get you to start thinking about the material prior to classroom discussions, and (3) introduce you to how I ask questions so you are better prepared for quizzes. I realize that sometimes life happens and you aren't able to devote as much time as you want to your courses – therefore, you will be able to drop your two lowest scores on these questions.

Exams & Projects:
There will be two take home exams in the course (first and second weekend of the block). Each exam will ask you to integrate material covered in lecture, discussions, and labs, as well as material from the textbook and readings. The exams are closed book and you should take no longer than 2 hours (you will download the exam from canvas and then upload it, each action is time stamped). If you require additional time to take exams, please talk to me and schedule your day/weekend accordingly.

There will be several labs during the course. Each will involve some type of summary report, although these will vary from short and informal to long and in scientific format.

During the third week of the course, while at Niwot Ridge, you will receive several data sets that you will analyze, in groups, to answer questions about how the local climate and climate forcers have varied over the last few decades. Reflecting upon the analysis you do in groups, you will explore "downstream effects" of climate change on modern ecosystems and/or society. You will work in groups to examine the data provided and the scientific literature. You will write a paper on your topic (i.e. while I expect your group to have similar topics and conclusions you all need to write an individual paper). This will be due Saturday (2/6) by 6 PM. More details on this project will be given out during week 3 of the block.

There are several misconceptions about climate change circulating in the public and amongst our elected officials. Some of these misconceptions are rooted in the general public's lack of scientific literacy while others were deliberately created as part of misinformation campaigns. After three weeks of immersing yourself in climate science you will create a short Climate Change Public Service Announcement (live action, animated, or a combination). You will work in groups on this project and they will be viewed (and graded) by the class on the last Wednesday of the block. Details will be discussed in class & posted on canvas. In addition, as a "warm up" for the PSA you will write a mock letter to the editor OR create a mock

webpage/flyer disseminating the information you learned in one of the four lab assignments. This is due Friday of week 3.

Grading:

Lab & in-class activities	20%
Exams	40%
Niwot Ridge Project	20%
Climate Communication Assignment	5%
Climate PSA	10%
Online Questions (Canvas)	5%

Grade Assignment ("+" and "-" will also be given when appropriate):
A = 90-100%
B = 80-89%
C = 70-79% S = 70-100%
D = 65-69% CR= 65-69% NC = below 65%
D+, D, CR, and NC does not fulfill EV Department major requirements.

Late assignment policy:
Late assignments will get a deduction of 1/3 of a letter grade (3%) for every day it is late (part of 1 day counts as a day). For example, if the paper is due Monday at 9AM and you turn it in at 3PM on Monday, that would count as being 1 day late and the grade would go from a B to B-.

Honor Code:
Failure to properly document sources in papers, plagiarism, copying from other student's work, or turning in assignments that have already been submitted for credit in other courses are among some of the actions considered intellectual theft under the Colorado College Honor System. I encourage you to work together and talk through issues, but your final written work must be your own. I will give you further information on how the honor code applies to specific assignments as we go. If you are uncertain about the Honor Code's application to a particular project, please ask me. If you have questions or to read further details of the Honor Code see: http://www.coloradocollege.edu/other/honorcouncil/constitution-bylaws/constitution.dot

Disability Accommodations
If you have a disability and require accommodations for this course, please speak with me privately today or tomorrow so that your needs may be appropriately met. You may also simply email me your accommodations letter, if I have questions I can ask you. If you have not already done so, you will need to register with Accessibility Resources (Learning Commons in Tutt Library, 227-8285), the office responsible for coordinating accommodations and services for students with disabilities.

Tentative Course Schedule (next page)
The course will be broken up into ~4 sections: the climate engine & causes of change, past change, humans and climate, and impacts on ecosystems. Each day's lectures, labs, and discussions will be based upon a question that we will try and answer. By the end of the course, you should be able to have a meaningful discussion about these questions.

Everything on the syllabus and schedule is subject to change.

Day	**AM** (Tutt 105)	**PM** (Tutt 105 or computer lab)	**Readings for the following day**
1/18	Introduction to earth systems & climate		Ruddiman Ch 2.1 and 2.2 + Dessler Ch 3
1/19	Radiation balance GIS LAB: Differential heating of the surface	**Differential heating of surface** continued (Barnes Computer Lab) due **Wednesday 5 PM**	Archer Ch 4 & Dessler Ch 4
1/20	Modeling earth temperatures; albedo & greenhouse gases		Kump Ch 4 & 5. *Optional: Ruddiman Ch 2.3 to 2.8*
1/21	Atmosphere & ocean circulation patterns, LAB: Imaginary Earth	**Imaginary Earth** continued (Tutt 105) **due Friday 4 PM**	Ruddiman pg 8 -13, Ch 2 pg 30-35, Boxes 2.2, 2.3, 2.4 & 2.6
1/22	Climate Feedbacks on the Earth System		Ruddiman pp 56-69, 84-91, 110-118, 138-155
Exam #1 *(must be completed by Monday morning 9 AM)*			
1/25	Water & carbon cycles; Climate proxies, Gradual long-term climate change		Kump Ch 14 + Ruddiman Ch 10
1/26	Cyclic climate change & orbital variations; *Guest Speaker: Dr. Todd Sanford*	**LAB: Marine isotope records** (Tutt 105) **due Wednesday 5 PM**	Zachos et al 2008 + assigned reading from Abrupt Climate Change folder
1/27	Abrupt threshold climate change		Kump Ch 15 + relevant news article about El Nino
1/28	Short-term climate change, ENSO LAB: Understanding ENSO	**Understanding ENSO** continued (Tutt 105) **due Friday 4 PM**	Assigned paper from Society-Climate Folder
1/29	Human's response to past climate change		
Exam #2 *(must be completed by Monday morning 7:45 AM)*			
2/1	**Go to Mountain Research Station** @ Niwot Ridge – Climate Impacts on Mountain Ecosystems (LAB: Meteorological Data) **meet at 8 AM**, outside Tutt Science (Nevada side)		Read assigned Present Day Climate Change paper for tomorrow morning's discussion
2/2	**In field -** Present Climate Change Discussion	Field / work on projects	
2/3	**In field** – work on group projects, **return to CC by 4 PM**		
2/4	Group Meetings with me		
2/5	Group Meetings with me		**Climate Communication Assignment due 4 PM**
Modern Climate Change Impacts Paper due on Saturday by 6 PM			
2/8	Current State of Climate Policy	Group Meetings with me	
2/9	Group Meetings with me	Group Meetings with me	
2/10	**Climate PSA Viewing & Evaluation**		