

## **EV 128: Introduction to Global Climate Change, Block 1, 2019**

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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 both present day and ancient societies. We 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 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 addition to these help sessions and my office hours, please utilize the QRC for additional assistance.

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. There will be occasions where you will need to be able to answer questions on this reading and/or material covered in previous classes – these short exercises serve 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). I will always 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.

**Attendance.** We will be covering a lot of material in this course, with every day building on the previous day. In order to learn from and with each other and include all voices, attendance at all class meetings is expected. It is your responsibility to contact me directly if you are unable to attend class due to an emergency. 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 need to have a note from Boettcher or another doctor for your absence to be considered *excused*.

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

**Note about assignment deadlines and student-teacher-human well-being.** I am dedicated to providing you thorough and specific feedback to help you improve your work; this means I have dedicated time in my own schedule for reviewing assignments. Sometimes life gets in the way, and we have to submit something we know isn't completely edited or as well developed, as we would like. I would much rather have you turn in something that is a work in progress than delay and become overwhelmed with too many overdue assignments at the end of the block. I am not a huge fan of taking "points off" for lateness, as it contradicts the developmental and human-focused commitments I have made as an educator. I have set deadlines in a way that I hope provides you the maximum flexibility in completing assignments, yet keeps you on pace to not get behind in the necessary "practice" of working with scientific concepts. I will usually be able to accommodate a day or two extension, but please keep in mind that the pace of the block is unforgiving and things WILL build up. Plus, if you turn something in *after* the deadline, feedback will likely be delayed (potentially significantly). I highly encourage you to schedule time off on the weekends to spend with your friends or family, engaging in creative and activist endeavors, going outside for a hike, or to the movies, or to simply relax. Whenever possible the course schedule was created to encourage said "mental breaks."

**Commitment to Diversity, Equity, & Inclusion.** I am committed to making the classroom a place that enhances all students' learning, a place where students are both respected and challenged. To the best of my abilities, I seek to make pedagogical choices that advance this goal. Outside of class, I run [mentoring programs](#) aimed at increasing the retention of women in earth and environmental sciences and conduct [bystander intervention trainings for faculty](#) to improve workplace climate. My commitment to diversity, equity, and inclusion does not mean I think I am perfect - all of us make mistakes. I will do my best to acknowledge these, along with my privilege and biases; I ask that you do the same. This is not easy. It is uncomfortable. I recommend using "ouch and educate" as a way to let your peers know that you are hurt and why. Colorado College is our community and it is up to each of us to make it a safe and welcoming place for all to learn and succeed.

### Required Reading

- Dessler, Andrew. 2016. *Introduction to Modern Climate Change*. 2nd edition. Cambridge University Press.
- Chapters and articles posted on Canvas

**Field Trips** | In addition to the above activities, we will be going on two field trips – a one-day trip to [Florissant Fossil Beds National Monument](#) and a 3-day trip to the Mountain Research Station at Niwot Ridge during week three of the block. **You must sign up on Summit** (link is on Canvas & will be sent to you via email) – sign the consent form and fill out the medical form. I will pass around a sign up for food for the 3-day field trip in class, I ask that you bring a lunch for the Florissant field trip. To find out more about Niwot Ridge and the Mountain Research Center check out their website: [niwot.colorado.edu](http://niwot.colorado.edu).

**Office hours** | I will have office hours on many afternoons (in addition to the course help sessions) throughout the block. You can sign up for time here:

<https://docs.google.com/document/d/1SsmI2OFsS11uvYvlbZTuyX6Wj2SCHJS1yIFDmBs85y4/>

[edit?usp=sharing](#). If these times do not work for please talk with me before or after class to find another time.

**Canvas** | I will use Canvas extensively throughout the course. The course is divided into 4 modules: The Earth's Climate Engine (week 1), Climate Change of the Past (week 2), Climate Change in the Present (weeks 3 & 4), Wikipedia Project (throughout). I will do my best to have readings posted multiple days in advance. In addition, there will occasionally be writing prompts on Canvas that you must complete. The goals of these questions/prompts 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.

**Quizzes & Assignments** | There are **six quizzes** throughout the course (and no large exam). Each quiz will either be (1) closed book, starting toward the end of class and consisting of 1-3 questions *or* (2) one or two discussion questions posted to Canvas (open book). The quizzes will ask you to integrate material covered in lecture, discussions, and labs, as well as material from the textbook and readings on days prior. The in-class quizzes will typically take 15-30 minutes, if you require additional time, please talk to me and schedule your day accordingly.

During the first three weeks of class you will have **three labs** (GIS Radiation Balance, Vostok Ice Core, Niwot Temperature trends) that reinforce many of the ideas we will discuss in class from how greenhouse gases are necessary to make our planet livable to long-term drivers of climate. You will also start working on your **Women in STEM Wikipedia Biography**. In week three, we go to **the Mountain Research Station** and start thinking about how climate is changing now, what are the impacts, and how do we communicate this information. You will work in small groups to better understand how shifting climate is affecting ecosystems in the Intermountain West and the impacts these changes have on ecosystems and/or society.

**Grading:**

Labs	12%
Quizzes	36%
Climate Change Project	30%
Women in STEM Wiki Bio	12%
Participation	10%

**Grade Assignment** ("+" and "-" will also be given when appropriate):

A = 90.0-100%

B = 80.0-89.9%

C = 70.0-79.9%      S = 70.0-100%

D = 65.0-69.9%      CR= 65.0-69.9%      NC = below 65.0%

D+, D, CR, and NC do not fulfill EV Department major requirements.

**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 problems and assignments, but **your final work must be your own**, unless noted on the assignment (e.g. some labs you are welcome to turn in joint assignments). We 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. 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 her your accommodations letter; if she has questions she 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.

My goal is to make this course successful for all. If you have a need for classroom / course accessibility that isn't covered by the above statement or disability accommodations, you are welcome (not required) to discuss with me how I can best support you and your success in this class.

**Tentative Course Schedule** | The course will be broken up into ~3 sections: the climate engine & causes of change, climate change over thousands and millions of years (past), climate change effects on modern ecosystems (present). 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.

*The syllabus and schedule is subject to change depending on progress of the course.*

## **Week 1: The Earth's Climate Engine**

### *Day 1 – The Earth as a System*

- Course Introduction & The Earth as a System

### *Day 2 – Radiation Balance*

- Dessler Chapters 1, 2.1, & 3
- Radiation Balance Lab (GIS Lab) – Tutt Library.
- *optional* help session from 1:30 - 3:30 PM – Tutt Library GIS Lab

### *Day 3 – How Greenhouse Gases Work*

- **Quiz #1**
- Dessler Chapter 4
- *Skim* Archer Chapter 4 [on Canvas]
- *optional* help session 1:30 to 3:30 PM - Tutt Library GIS Lab or Barnes 209
- **Choose your scientist** [discussion question due, on Canvas **6 PM**]

### *Day 4 – Atmospheric & Ocean Circulation*

- Ruddiman Chapter 2, sections 2.3- 2.8 [on Canvas]
- **Radiation Balance Lab due** [submitted on Canvas]

### *Day 5 – Circulation Con't & Feedbacks*

- **Quiz #2**
- Ruddiman pgs 8-13 [on Canvas]
- Dessler Chapter 6
- **What is notable about your scientist?** [discussion question, on Canvas, **due 5 PM**]

### *Sat/Sun.*

- Go over your notes; are there things you don't understand? Check out the readings in the extra reading folder [on canvas] – it is there to provide greater understanding.

Perhaps one author explains it better than the other. Please ask me questions! Send me an email; it will help me prepare my review for Monday.

- Are you on track for the Wikipedia project?

## Week 2: Climate of the Past

### Day 6 – Carbon Cycling and Long Term Change

- **Quiz #3**
- Ruddiman Chapter 2, pgs 30-35 [on Canvas]
- Dessler Chapter 5
  
- *Optional help session: Wikipedia, 1:30-3 PM Barnes 209*

### Day 7: How do we know what past climates looked like?

- **Facts about your Scientists** [discussion question, on Canvas **9 AM**]
- **FIELD TRIP: Florissant Fossil Beds National Monument**  
Leave at 9 AM (from class) back on campus by 3 PM
- What are proxies? Ruddiman pgs 56-69 [on Canvas]

### Day 8 – Intermediate Climate Change

- **Quiz #4**
- Kump Chapter 14, pgs 274-281 [on Canvas]
- *Skim* Ruddiman Chapter 10 [on Canvas]

### Day 9 – Abrupt Climate Change

- Zachos et al 2008 – just the abstract, figures + captions [on Canvas]
- Kump 2011 or Nash 2008 [articles and assignments on Canvas]
- *Optional help session: Vostok Ice Core Lab, 1:30-3 PM, Barnes 209*
- **Vostok Ice Core Lab due** [submitted to Canvas]

### Day 10 – Climate Change & Past Societies

- **Quiz #5**
- Read assigned articles [articles and assignments on Canvas]

### Sat/Sun

- Take a break! Go for a hike, veg out in your room. *I beg of you - do not think about class for 24 hours!*
- Pack for the Niwot field trip. Check the weather. Please come prepared to be at elevation. See Canvas for packing list and links to the gear house to borrow appropriate clothing FOR FREE.
- Catch up on Wikipedia project – make sure you have a notable work to summarize at Niwot

## Week 3: Climate Change is Happening Now!

### Day 11 – Climate Change in the Present

- **Niwot Field Trip! Meet 9 AM Tutt Science Circle**, leaving promptly at 9:15 AM
- *Mountain Research Station (near Ward, CO)*
- Measuring the air, water, and soil
  - Jennifer Morse, Univ. of Colorado

*Day 12 – Current Climate Change & Mountain Ecosystems*

- Climate Change and Mountain Ecosystems [readings on Canvas]
  - Read assigned article [on Canvas] be prepared for discussion
- Science Communication with Dr. Jane Zelikova
- **Brief article summary** on your Wikipedia scientist – have ready to workshop.
- **Temperature trends lab** due [upload to Canvas by end of the day]

*Day 13 – Current Climate Change & Mountain Ecosystems*

- Leave Mountain Research Station ~ 12 PM, back on campus by 3 PM
- **Wiki article summary** [upload to Canvas by end of the day]

*Day 14 – Climate Change & Society*

- Read assigned article [articles and assignments on Canvas]
- Executive Summary of 1.5°C IPCC Report [on Canvas]
- Introduce Climate Change & West Project
- **Quiz #6** [posted on canvas, **due by 8 PM**]

*Day 15 – Work day & Wikipedia Peer Review, meet at 10 AM*

- Office hours available throughout the day for project consultation
- Please have your Wikipedia biography as up to date as possible – more draft, more help. Your **Wikipedia draft** should be written in sandbox and ready to get peer reviewed by **10 AM**

*Sat/Sun*

- **Wikipedia Biography finalized** in sandbox by **Sunday at 8 AM.**
- Work on projects

**Week 4: Science. Climate. Society**

*Day 16 – Peer review of Final Paper*

- **Draft of Final Paper due by 9:30 AM** (class starts at 10 AM)

*Day 17 – Climate Change in the Western US presentations*

- **Group Presentations 9 AM**

*Day 18 – Wrap Up*

- Be prepared to discuss your Wikipedia scientist
- *Class will be over by 10:30 AM*
- **Climate Change & the West Paper** due **12 PM** [on Canvas]