

## EAR 111: Climate Change: Past and Present (Fall 2022)

<b>Location/Time:</b> Shemin Auditorium MWF 10:35-11:30 pm		
<b>Instructor:</b>	Dr. Melissa Chipman	<b>Phone:</b> 315-443-2489
<b>Office:</b>	HGL 317B	<b>E-mail:</b> <a href="mailto:mlchipma@syr.edu" style="color: white;">mlchipma@syr.edu</a>
<b>Office Hrs:</b>	M/W 11:30-12:30 pm	
<b>TAs</b>	Claire Rubbelke * Heather Gunn Tyler Logie	Email: <a href="mailto:crubbelk@syr.edu" style="color: white;">crubbelk@syr.edu</a> *TA coordinator Email: <a href="mailto:hagunn@syr.edu" style="color: white;">hagunn@syr.edu</a> Email: <a href="mailto:tlogie@syr.edu" style="color: white;">tlogie@syr.edu</a>

### Course Description:

Introduction to the science of climate change from the geological record. Major drivers of global climate, measuring change, and forecasting future climate. Role of human activities in present climate.

### Additional Course Description:

This course is designed to introduce students of all disciplines to the science behind our understanding of Earth's climate system and changes in that system through time. Topics discussed in the class include:

- The fundamentals of the climate system from the sun to the atmosphere to the oceans
- Drivers of the climate system and their interactions
- Overview of climate throughout the history of the Earth
- Elucidating past climate change from geological records
- Natural vs. anthropogenic (human-forced) climate change
- Impacts of climate change on natural systems and human activities
- Evaluating solutions to climate change on a variety of scales

**Prerequisite / Co-requisite:** None.

**Audience:** Undergraduate students

**Credits:** 3

### Learning Objectives:

After taking this course, students will be able to:

- Explain the major components of the Earth's climate system, including the global energy balance, drivers of atmosphere circulation, ocean circulation, and the carbon cycle
- Describe the climate and drivers of climate over geologic time
- Explain the greenhouse effect and how it relates to anthropogenic warming
- Describe the impacts of modern climate change on the planet and the role of humans

### Required Texts / Supplies:

#### **Recommended Textbooks:**

**Earth's Climate: Past and Future** by W.F. Ruddiman

**The Earth System** by Kump, Kasting, and Crane

*Recommended texts can be purchased at the University bookstore or online. Readings will also be posted online in Blackboard in the weekly content folders.*

### Course Requirements and Expectations:

**Blackboard:** Note that class readings, recitation assignments, and course business will be posted on Blackboard for this class. **You are responsible for checking the site regularly to access course materials.** Any mailings regarding this course will be sent to your Syracuse email addresses, not to private accounts, so please be sure to check your SU account regularly.

**Lectures:** All lectures will be in person (**see attendance policy**). If you are motivated to learn about climate change, do the assigned readings to prepare for lecture beforehand, attend lectures each week, and take notes. Everything in the exams will be covered in lectures and readings.

**Recitations:** You must register for one recitation (**sections M002-M012**) in addition to the lecture (**section M001**). Getting a good grade will be easier in the recitation than exams, so make sure you turn in the recitation assignments each week and attend the meetings. *Recitation assignments are posted on Blackboard on Mondays by 8am and are always due the following Monday by 6pm.* Physical copies are distributed by your TA during your recitations. You will meet for your recitations in person (see below):

Section	Meeting Time	Location	Your TA
M002	Mon 8:25 AM - 9:20 AM	Heroy Geology Bldg 217	Tyler Logie
M003	Wed 11:40 AM - 12:35 PM	Heroy Geology Bldg 102	Tyler Logie
M004	Fri 9:30 AM - 10:25 AM	Heroy Geology Bldg 110	Claire Rubbelke
M005	Fri 12:45 PM - 1:40 PM	Heroy Geology Bldg 102	Claire Rubbelke
M006	Tue 5:00 PM - 5:55 PM	Heroy Geology Bldg 110	Tyler Logie
M007	Tue 3:30 PM - 4:25 PM	Heroy Geology Bldg 210	Tyler Logie
M008	Wed 8:25 AM - 9:20 AM	Heroy Geology Bldg 217	Heather Gunn
M009	Tue 9:30 AM - 10:25 AM	Heroy Geology Bldg 110	Claire Rubbelke
M010	Wed 9:30 AM - 10:25 AM	Heroy Geology Bldg 102	Heather Gunn
M011	Tue 8:00 AM - 8:55 AM	Heroy Geology Bldg 102	Heather Gunn
M012	Thu 8:00 AM - 8:55 AM	Heroy Geology Bldg 102	Heather Gunn

**Exams:** Exams will be administered online through Blackboard on exam day and are multiple choice. They are open book/open notes, but students are expected to work alone. Students can access the exam any time on exam day between 9am and 7pm. However, once the exam is opened, it must be taken in one setting and cannot be reopened once submitted. Students are given 1.5 hours to take the one hour exam. ODS accommodations will be built in on a person-by-person basis based on ODS letters. Any student who cannot take the exam online must contact the TA coordinator for this course at least one week prior to exam day to arrange for taking the exam in person.

**Grading:**

- Exam 1 25%
- Exam 2 25%
- Exam 3 25%
- Recitations 25%

**Grades will be posed as % correct in Blackboard. To calculate your final grade, I will use the following equation:**  

$$\text{Final Grade} = (\text{Exam1} \times 0.25) + (\text{Exam2} \times 0.25) + (\text{Exam3} \times 0.25) + (\text{Average of Recitation Assignments} \times 0.25)$$

**Grading Table**

Grade	Percentage Range
A	93% and above
A-	90-92%
B+	87-89%
B	83-86%
B-	80-82%
C+	77-79%
C	73-76%
C-	70-72%
D	60-69%
F	59% and below

**Course Specific Policies:**

**Attendance:**

- **LECTURE:** You are expected to attend all lectures during the regularly scheduled time. Lectures will not be recorded.
- **RECITATIONS:** You are expected to attend your recitation section at the scheduled time. You are not allowed to attend a recitation that you are not registered for. Even if you miss the recitation meeting, **you are still expected to turn in your recitation assignments to your TA by the due date.** Recitation grades will be docked by 10% for every day they are late.

**Make-up Exams:** Make-up exams only be given in documented, exceptional circumstances, and **MUST BE SCHEDULED AT LEAST 1 WEEK BEFORE THE EXAM.** Documentation is required.

**Extra credit:** Additional assignments may be announced to improve your grade. **For fairness and equity, I will not give extra points to students just because they ask (so please do not).**

### **University Attendance Policy**

Attendance in classes is expected in all courses at Syracuse University. Students are expected to arrive on campus (or be online) in time to attend the first meeting of all classes for which they are registered. Students who do not attend classes starting with the first scheduled meeting may be academically withdrawn as not making progress toward degree by failure to attend. Instructors set course-specific policies for absences from scheduled class meetings in their syllabi. It is a federal requirement that students who do not attend or cease to attend a class to be reported at the time of determination by the faculty. Faculty will use Orange Success to alert the Office of the Registrar and the Office of Financial Aid. A grade of NA is posted to any student for whom the Never Attended flag is raised in Orange SUccess. More information regarding Orange SUccess can be found here, at <http://orangesuccess.syr.edu/getting-started-2/>.

### **Syracuse University Policies**

**Religious Observances Notification and Policy:** Steps to follow to request accommodations for the observance of religious holidays can be found at: [http://supolicies.syr.edu/studs/religious\\_observance.htm](http://supolicies.syr.edu/studs/religious_observance.htm)

**Orange Success:** Tools to access a variety of SU resources, including ways to communicate with advisors and faculty members can be found at: <http://orangesuccess.syr.edu/getting-started-2/>

**Diversity and Disability** The rights and responsibilities of students in a diverse, inclusive, accessible, bias-free campus can be found at: <https://www.syracuse.edu/life/accessibilitydiversity/>.

**Disability-Related Accommodations:** Syracuse University values diversity and inclusion; we are committed to a climate of mutual respect and full participation. There may be aspects of the instruction or design of this course that result in barriers to your inclusion and full participation in this course. I invite any student to meet with me to discuss strategies and/or accommodations (academic adjustments) that may be essential to your success and to collaborate with the Office of Disability Services (ODS) in this process. If you would like to discuss disability-accommodations or register with ODS, please visit their website at: <http://disabilityservices.syr.edu>. Please call (315) 443-4498 or email [disabilityservices@syr.edu](mailto:disabilityservices@syr.edu) for more detailed information. ODS is responsible for coordinating disability-related academic accommodations and will work with the student to develop an access plan. Since academic accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible to begin this process.

**Academic Integrity Policy:** Syracuse University's Academic Integrity Policy reflects the high value that we, as a university community, place on honesty in academic work. The policy holds students accountable for the integrity of all work they submit and for upholding course-specific, as well as university-wide, academic integrity expectations. The policy governs citation and use of sources, the integrity of work submitted in exams and assignments, and truthfulness in all academic matters, including course attendance and participation. The policy also prohibits students from: 1) submitting the same work in more than one class without receiving advance written authorization from both instructors and, 2) using websites that charge fees or require uploading of course materials to obtain exam solutions or assignments completed by others and present the work as their own. Under the policy, instructors who seek to penalize a student for a suspected violation must first report the violation to the Center for Learning and Student Success (CLASS). Students may not drop or withdraw from courses in which they face a suspected violation. Instructors must wait to assign a final course grade until a suspected violation is reviewed and upheld or overturned. Upholding Academic Integrity includes abiding by instructors' individual course expectations, which may include the protection of their intellectual property.

**Students should not upload, distribute, or otherwise share instructors' course materials without permission.** Students found in violation of the policy are subject to grade sanctions determined by the course instructor and non-grade sanctions determined by the School or College where the course is offered, as described in the Violation and Sanction Classification Rubric. Students are required to read an online summary of the University's academic integrity expectations and provide an electronic signature agreeing to abide by them twice a year during pre-term check-in on MySlice.

**Course Schedule:** Topics for the lecture, required readings, and recitations

Part I: Earth's Climate System					
Theme	Reading	Date/Day	Lecture Topic	Recitation	
Climate System	Syllabus Rudd Ch 1 Kump Ch 2	29-Aug M	Introduction	Introduction (Attend recitation)	
		31-Aug W	The Climate System		
		2-Sep F	Climate System Feedbacks		
Temperature	Kump Ch 3	5-Sep M	Labor Day - No Classes	Feedbacks and Energy Balance (Due 12-Sep)	
		7-Sep W	Global Energy Balance		
		9-Sep F	The Greenhouse Effect		
Wind and Rain	Kump Ch 4	12-Sep M	Atmospheric Circulation	Atmospheric Circulation (Due 19-Sep)	
		14-Sep W	Wind		
		16-Sep F	Precipitation		
		19-Sep M	Monsoons		
Ocean and Ice	Kump Ch 5-6	21-Sep W	Surface Ocean Circulation	Ocean Circulation (Due 26-Sep)	
		23-Sep F	Deep Ocean Circulation		
		26-Sep M	The Cryosphere		
Exam 1	Optional: Rudd Ch 2	28-Sep W	Review: Earth's Climate System	No recitation	
		30-Sep F	Exam 1		
Part II: Climate Forcing on Different Timescales					
Theme	Reading	Date/Day	Lecture Topic	Recitation	
Paleoclimate	Rudd Ch3 pt1 Rudd Apx 1	3-Oct M	Climate Archives	Climate Archives (Due 10-Oct)	
		5-Oct W	Isotopes and Paleoclimate		
Carbon and Climate Change	Kump Ch 8 Rudd Ch 5-7	7-Oct F	Carbon Cycle	Carbon Cycle (Due 17-Oct)	
		10-Oct M	Tectonic Forcing		
		12-Oct W	Volcanism & Greenhouse Climate		
		14-Oct F	Weathering & Icehouse Climate		
Ice Ages	Kump Ch 14 Rudd Ch 10-11	17-Oct M	Astronomical Forcing	Long-Term Climate Forcing (Due 24-Oct)	
		19-Oct W	Ice Ages		
		21-Oct F	Ice Ages and GHGs		
Climate Since Last Ice Age	Rudd Ch 14,15,17	24-Oct M	Last Glacial Maximum	The Ice Ages (Due 31-Oct)	
		26-Oct W	The Holocene		
		28-Oct F	Abrupt Climate Change		
Exam 2	Optional: Lear et al. 2020	31-Oct M	Review: Climate Forcing	No recitation	
		2-Nov W	Exam 2		
Part III: Humans and Climate Change					
Theme	Reading	Date/Day	Lecture Topic	Recitation	
Humans and Climate Change	Rudd Ch 16	4-Nov F	Climate and Humans I	Climate Impacts on Humans (Due 14-Nov)	
		7-Nov M	Climate and Humans II		
		9-Nov W	The Anthropocene		
		11-Nov F	Industrial Revolution		
Modern Global Warming	Rudd Ch 18-19 Rudd Ch3 pt2	14-Nov M	Climate Since 1850 AD	Anthropogenic Climate Change **(Due 18-Nov)**	
		16-Nov W	Climate Science & Global Warming		
		18-Nov F	Climate Models		
Nov 20-Nov 27 = Thanksgiving					
Future Climate	Rudd Ch 20 Kump Ch 16	28-Nov M	Carbon and Future Climate	Climate Science (Due 5-Dec)	
		30-Nov W	Impacts of Global Warming		
		2-Dec F	Adaptation vs. Mitigation		
		5-Dec M	Climate Myth Busting		
Exam 3	Optional: IPCC 2021	7-Dec W	Review: Humans & Climate Change	No recitation	
		9-Dec F	Exam 3		