

EAR 111: Climate Change: Past and Present (Fall 2024)

Location/Time: Shemin Auditorium MWF 10:35-11:30 am			
Instructor:	Dr. Melissa Chipman	Phone:	315-443-2489
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Office Hrs:	M/W 11:30 am -12:15 pm		

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 and

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 and are not recorded. You are expected to attend all lectures during the regularly scheduled time. 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 lecture.**

Lecture Schedule: Lecture topics and readings. All materials are located online in Blackboard.

Unit 1: Earth's Climate System				
Theme	Reading	Date/Day		Lecture Topic
Climate System	Syllabus Rudd Ch 1 Kump Ch 2	Aug 26	M	Introduction
		Aug 28	W	The Climate System
		Aug 30	F	Climate System Feedbacks
Temperature	Kump Ch 3	Sep 2	M	Labor Day - No Classes
		Sep 4	W	Global Energy Balance
		Sep 6	F	The Greenhouse Effect
Wind and Rain	Kump Ch 4	Sep 9	M	Atmospheric Circulation
		Sep 11	W	Wind
		Sep 13	F	No Lecture
		Sep 16	M	Precipitation and Monsoons
Ocean and Ice	Kump Ch 5-6	Sep 18	W	Surface Ocean Circulation
		Sep 20	F	Deep Ocean Circulation
		Sep 23	M	The Cryosphere
Exam 1		Sep 25	W	Review: Earth's Climate System
		Sep 27	F	Exam 1
Unit 2: Climate Forcing on Different Timescales				
Paleoclimate	Rudd Ch3 pt1 Rudd Apx 1	Sep 30	M	Climate Archives
		Oct 2	W	Isotopes and Paleoclimate
Tectonic Forcing	Kump Ch 8 Rudd Ch 5-7	Oct 4	F	Carbon Cycle
		Oct 7	M	Tectonic Forcing
		Oct 9	W	Volcanism & Greenhouse Climate
		Oct 11	F	Weathering & Icehouse Climate
Astronomical Forcing	Kump Ch 14 Rudd Ch 10-11	Oct 14	M	Fall Break – No Classes
		Oct 16	W	Astronomical Forcing
		Oct 18	F	Ice Ages
		Oct 21	M	Ice Ages and GHGS
Short-Term Forcing	Rudd Ch 14,15,17	Oct 23	W	Last Glacial Maximum
		Oct 25	F	The Holocene
		Oct 28	M	Short-Term Forcing
Exam 2		Oct 30	W	Review: Climate Forcing
		Nov 1	F	Exam 2
Unit 3: Humans and Climate Change				
Humans and Climate	Rudd Ch 16	Nov 4	M	Climate and Humans I
		Nov 6	W	Climate and Humans II
		Nov 8	F	The Anthropocene
		Nov 11	M	Industrial Revolution
Modern Global Warming	Rudd Ch 18-19 Rudd Ch3 pt2	Nov 13	W	Climate Since 1850 AD
		Nov 15	F	Climate Science & Global Warming
		Nov 18	M	Climate Models
Future Climate	Rudd Ch 20	Nov 20	W	Carbon and Future Climate
		Nov 22	F	Climate Myth-Busting
Nov 24-Dec 1: Thanksgiving Break				
Climate Solutions	Kump Ch 16	Dec 2	M	Impacts of Global Warming
		Dec 4	W	Adaptation and Mitigation
Exam 3		Dec 6	F	Review: Humans & Climate Change
		Dec 9	M	Exam 3

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

Recitation Meetings: There are a total of **TEN recitation meetings with assignments** throughout the semester. See Blackboard for the recitation schedule, location, and TA information for your section. You must register for one recitation (**sections M002-M013**) in addition to lecture (**section M001**). Recitation meetings are in-person only. You are expected to attend your recitation section at the scheduled time and location. You are not allowed to attend a recitation you are not registered for.

Recitation Assignments: Assignments are available as pdfs on Blackboard. Your TAs will also print a copy for your meeting. It is best to turn these in to your TA at the end of your recitation meeting. Dates in the table are the final due dates for each assignment to avoid grade penalties. Even if you miss the recitation meeting, you are still expected to turn in your recitation assignments to your TA by the due date at 5pm. Recitation grades will be docked by 10% for every day they are late, no exceptions.

Recitation Assignment	DUE DATE (by 5pm)
R0: Introduction	Fri Aug 30
R1: Energy and Feedbacks	Fri Sept 13
R2: Atmospheric Circulation	Fri Sept 20
R3: Ocean Circulation	Fri Sept 27
R4: Archives and Isotopes	Fri Oct 11
R5: Carbon and Tectonics	Fri Oct 25
R6: Ice Ages	Fri Nov 1
R7: Climate and Humans	Fri Nov 15
R8: Anthropogenic Climate	Fri Nov 22
R9: Climate Science	Fri Dec 6

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:

$$\text{Final Grade} = (\text{Exam1} + \text{Exam2} + \text{Exam3} + \text{Average of Recitations}) \text{ divided by } 4$$

Grade	Percentage Range
A	94% and above
A-	90% to <94%
B+	87% to <90%
B	83% to <87%
B-	80% to <83%
C+	77% to <80%
C	73% to <77%
C-	70% to <73%
D	60 to <70%
F	<60%

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

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.

Syracuse University Policies:

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/>.

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

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 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 states that any work a student submits for a course must be solely their own unless the instructor explicitly allows collaboration or editing. The policy also requires students to acknowledge their use of other peoples' language, images or other original creative or scholarly work through appropriate citation. These expectations extend to the new, fast-growing realm of artificial intelligence (AI) as well as to the use of websites that charge fees or require uploading of course materials to obtain exam solutions or assignments. Students are required to ask their instructor whether use of these tools is permitted – and if so, to what extent – before using them to complete any assignment or exam. Students are also required to seek advance permission from instructors if they wish to submit the same work in more than one course. Failure to receive this permission in advance may violate the Academic Integrity Policy. 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 outlined 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