Syllabus

Geog/EARTHSC 4911

Earth’s climate: Past and Future  
Spring 2023 –Course # 4911

# Course overview

## Course information

* Class lecture periods: Tuesdays and Thursdays 12:45-2:05pm.
* Credit hours: 3
* Prerequisites: either EARTHSC/HIST/EEOB 1911 or GEOG 3900/3901H
* Mode of delivery: in person

## Instructors

Instructors:

Dr. Bryan G. Mark (address as Professor Mark)

* Email address: mark.9@osu.edu
* Phone number: 614-247-6180
* Office hours: T/R 11 a.m. -12 p.m. on zoom or by appointment

Dr. Matthew R. Saltzman

* Email address: saltzman.11@osu.edu
* Phone number: 614-292-0481
* Office hours: T/R 10 a.m. -11 a.m. on zoom or by appointment

# How this course works

**Class Format:** This course will be delivered ***in-person***, with all course materials accessible from OSU's **Carmen Canvas** interface.

**Credit hours and work expectations:** This is a **3-credit-hour course**. According to [Ohio State policy](https://ocio.osu.edu/blog/community/2015/08/18/free-microsoft-office-for-ohio-state-students), students should expect around 3 hours per week of time spent on direct instruction (instructor content and Carmen activities, for example) in addition to 6 hours of homework (reading and assignment preparation, for example) to receive a passing grade.

**Attendance and participation requirements:** Student attendance and participation will be tracked by use of TopHat, as well as completion of feedback and entrance/exit surveys. Students are expected therefore to be attentive regularly to the class Carmen page.

* **TopHat:** **RANDOM DURING LECTURES.** Regular assessment of understanding and participation will be evaluated and recorded via TopHat during lectures. We will count full credit for participating, but award additional extra credit for correct responses.
* **Group activities: PERIODIC. There will be in-class activities that will require active participation and a single group grade. The final project grade will be modified to reflect individual participation effort, but active involvement is expected from all students.**

# Course materials

## Textbook

## We will use a primary textbook for the class. Required weekly readings will help organize our inquiry into global climate change AND provide good reference to basic principles. Any edition is sufficient. It can be purchased through the OSU Bookstore.

## Ruddiman, W.F., *Earth’s Climate: Past and Future.* MacMillan.

## Other readings, media:

As relevant, we may introduce other readings from news and scientific journals, as well as mixed media (video, podcasts). These will all be provided as pdfs or URL links via Assignments in Carmen and linked to the weekly modules. As this is a rapidly developing field, these readings may change from semester to semester.

1. Intergovernmental Panel on Climate Change, Assessment Report #6, Ch 2 Changing State of Climate System, Gulev, S.K., P.W. Thorne, J. Ahn, et al., 2021: ChangingState of the Climate System. In Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 287–422, doi:10.1017/9781009157896.004. <https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/>

### carmen access

You will need to use [BuckeyePass](https://buckeyepass.osu.edu/) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

* Register multiple devices in case something happens to your primary device. Visit the [BuckeyePass - Adding a Device](http://go.osu.edu/office365help?sysparm_article=kb05025) help article for step-by-step instructions.
* Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.
* Download the [Duo Mobile application](https://resourcecenter.odee.osu.edu/carmenzoom/getting-started-carmenzoom?sysparm_article=kb05026) to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service.

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357 (HELP) and IT support staff will work out a solution with you.

# Grading and faculty response

## How your grade is calculated (% breakdown)

|  |  |
| --- | --- |
| Assignment category | % points |
| TopHat (quizzes) | 15 |
| Climate connections (2 during semester) | 10 |
| Team Projects (abstract and presentation) | 25 |
| Midterm exam | 25 |
| Final exam | 25 |
| **Total** | **100** |

## Assignment descriptions:

**Top Hat and Quizzes**: At least one quiz will be given per lecture, based on material presented in lectures, readings, videos and other online material from the respective module. Note that some material from previous modules may also be on quizzes. Students will receive points for both participation (0.2 points/question) and correct answers (0.8 points/question) for a total possible of 1 point per question.

**Climate connections (2):** Students will be required to find relevant articles published in main-stream news media, and write a 1-page synthesis describing how the story relates to any topic discussed in class, and how paleoclimate approaches, data and/or methods are used. These short essays will include properly cited references to scholarly literature. For example, daily news articles are readily accessible through the New York Times climate portal and serves as a reputable source of news and information https://www.nytimes.com/section/climate. Two submissions are required and can be submitted any time before the last week of lectures. Submission is electronic and uploaded via Carmen.

**Team project**: The final project will include a group presentation. The groups will be assigned early in the class, and students will be interacting throughout the semester to select a topic and complete a multi-media presentation.

*Description of Team Project Assignment*

During 4th week, we will split up into groups of 3-4 students. Each group will need to decide on a class-related topic that interests them, on which they will give a 20 minute presentation during the last 2 classes of the semester. Once you decide on something (I would recommend choosing about ½ way through the semester), let us know what it is. The assignment will be to follow the development of thinking on the topic through the literature, describing the evolution of the idea. This will involve making liberal use of ISI or GEOREF searches: each pointade in the presentation needs to be backed up by a peer-reviewed citation. The project includes the following deliverables:

• Topic and science question: 8th week. Science questions need to address a single, specific question related to the course material. Calculations are not required, but literature must be consulted in formulating the question.

• Abstract: 11th week. A paragraph elaborating the science question, and describing the main conclusions needs to be emailed to both instructors. Thus, the conclusions of the project should be mostly finalized by this time.

• Presentations: last week. The science question, analysis of the literature, and conclusions should be clearly presented. Examples related to the question and your answers need to be presented. For the presentation, Powerpoints are encouraged, but only to show figures – no written words are allowed on slides (besides references or figure labels). This helps you learn what you are talking about; otherwise, it’s easy to just recite words pulled from a paper. Each group member will need to contribute to equally to the presentation.

**Exams**: There will be a midterm and a final consisting of multiple choice and short answer essay questions. Some quantitative questions will require algebra and students will be able to show their work on these calculations. No calculus is required.

## Late assignments

Please refer to Carmen for due dates. Generally, modules will be completed by midnight on Monday night before new modules begin on Tuesdays (first class session of each week). Late assignments will be penalized by 10% per day late, and only accepted up to a maximum of 4 days late. If students anticipate having conflicts they are expected to discuss with instructors ahead of time.

## Grading scale

93–100: A   
90–92.9: A-   
87–89.9: B+  
83–86.9: B  
80–82.9: B-   
77–79.9: C+   
73–76.9: C  
70 –72.9: C-   
67 –69.9: D+   
60 –66.9: D  
Below 60: E

## Instructor feedback and response time

We provide the following list to give you an idea of our intended availability throughout the course. (Remember that you can call **614-688-HELP** at any time if you have a technical problem.)

* **Grading and feedback:** For regular assignments, you can generally expect feedback within 10 **days**. Some exercises and papers will take longer to grade.
* **Email:** We will generally reply to emails and Carmen messages within **24 hours on days when class is in session at the university**. Please add "G3900" to the subject in your email to identify yourself; we teach multiple classes.
* **Discussion board:** We will check and reply to messages in the Carmen discussion boards regularly.

# Other course policies

## Academic integrity policy

### Policies for this course

* **Quizzes and exams**: You must complete the TopHat quizzes and the exams by yourself, without external help or communication from the internet or other people.
* **Written assignments**: Your written assignments should be your own original work. In formal assignments, you should follow a consistent citation style (e.g. MLA, APA, or AGU) to cite the ideas and words of your research sources. You are encouraged to ask a trusted person to proofread your assignments before you turn them in—but no one else should revise or rewrite your work.
* **Reusing past work**: In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with us.
* **Falsifying research or results**: All research you will conduct in this course is intended to be a learning experience; you should never feel tempted to make your results or your library research look more successful than it was.
* **Collaboration and informal peer-review**: The course includes opportunities for formal collaboration with your classmates. While study groups and peer-review of major written projects is encouraged, remember that comparing answers on a quiz or assignment is not permitted. If you're unsure about a particular situation, please feel free just to ask ahead of time.
* **Group projects**: This course includes group projects, which can be stressful for students when it comes to dividing work, taking credit, and receiving grades and feedback. We have attempted to make the guidelines for group work as clear as possible for each activity and assignment, but please let us know if you have any questions.

### Ohio State’s academic integrity policy

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the university’s [*Code of Student Conduct*](https://osu.zoom.us/), and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the university’s *Code of Student Conduct* and this syllabus may constitute “Academic Misconduct.”

The Ohio State University’s Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: “Any activity that tends to compromise the academic integrity of the university or subvert the educational process.” Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the university’s Code of Student Conduct is never considered an excuse for academic misconduct, so I recommend that you review the Code of Student Conduct and, specifically, the sections dealing with academic misconduct.

**If we suspect that a student has committed academic misconduct in this course, we are obligated by university rules to report my suspicions to the Committee on Academic Misconduct.** If COAM determines that you have violated the university’s Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact us.

Other sources of information on academic misconduct (integrity) to which you can refer include:

* The Committee on Academic Misconduct web pages ([COAM Home](mailto:slds@osu.edu))
* Ten Suggestions for Preserving Academic Integrity ([*Ten Suggestions*](http://oaa.osu.edu/coamtensuggestions.html))
* Eight Cardinal Rules of Academic Integrity ([www.northwestern.edu/uacc/8cards.htm](https://osuitsm.service-now.com/selfservice/kb_view.do))

## Copyright disclaimer

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

## Statement on Title IX

All students and employees at Ohio State have the right to work and learn in an environment free from harassment and discrimination based on sex or gender, and the university can arrange interim measures, provide support resources, and explain investigation options, including referral to confidential resources.

If you or someone you know has been harassed or discriminated against based on your sex or gender, including sexual harassment, sexual assault, relationship violence, stalking, or sexual exploitation, you may find information about your rights and options at [titleix.osu.edu](mailto:8help@osu.edu) or by contacting the Ohio State Title IX Coordinator at [titleix@osu.edu](http://oaa.osu.edu/coam.html). Title IX is part of the Office of Institutional Equity (OIE) at Ohio State, which responds to all bias-motivated incidents of harassment and discrimination, such as race, religion, national origin and disability. For more information on OIE, visit [equity.osu.edu](mailto:equity@osu.edu) or email [equity@osu.edu](http://titleix.osu.edu/).

## Your mental health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you find yourself feeling isolated, anxious or overwhelmed, please know that there are resources to help: [ccs.osu.edu](https://osuitsm.service-now.com/selfservice/kb_view.do). You can reach an on-call counselor when CCS is closed at (614) 292-5766 and 24 hour emergency help is also available through the 24/7 National Prevention Hotline at 1-(800)-273-TALK or at [suicidepreventionlifeline.org](http://go.osu.edu/credithours). The Ohio State Wellness app is also a great resource available at [go.osu.edu/wellnessapp](http://go.osu.edu/wellnessapp).

# Course schedule

See separate document that will be updated regularly on Carmen and labeled with current version date. Class content is subject to change, so students should download most current version. Changes will also be communicated using Announcements on Carmen.

# Accessibility accommodations for students with disabilities

## Requesting accommodations

The university strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability including mental health, chronic or temporary medical conditions, please let us know immediately so that we can privately discuss options. To establish reasonable accommodations, we may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. **SLDS contact information:** [slds@osu.edu](https://ocio.osu.edu/help/hours); 614-292-3307; 098 Baker Hall, 113 W. 12th Avenue.

**WEEKLY SCHEDULE**

**Class Topics, Required Readings, and Exercises**

\*Note: These topics and readings are *subject to change*! Students will be advised of updates to the schedule on Carmen, and should follow the version with most current date. R = Ruddiman; IPCC = IPCC Changing State of Climate System (Ch2)

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| --- | --- | --- | --- | --- | --- | --- |
| **Wk** | **Module-Part** | **Lecture topic** | **Date** | **Final project** | Instructor | **Text chapter** |
| 1 | **Part I** Framework of Climate Science | 1. Overview of climate science | T 1/12 |  | Both | R1 (3-18) |
| 2. Earth’s Climate System Today | R 1/14 |  | Bryan | R2 (19-54); IPCC (287-295) |
| 2 | 3. Climate Archives, Data, and Models (1) | T 1/19 |  | Bryan | R3 (55-68); IPCC (296-317) |
| 4. Climate Archives, Data, and Models (2) | R 1/21 |  | Matt | R3 (68-80) |
| 3 | **Part II** Tectonic-Scale Climate Change | 5. CO2 and Long-Term Climate | T 1/26 |  | Matt | R4 (81-96) |
| 6. Plate Tectonics and Long-Term Climate (1) | R 1/28 |  | Matt | R5 (97-107) |
| 4 | 7. Plate Tectonics and Long-Term Climate | T 2/02 |  | Matt | R5 (108-120) |
| 8. Greenhouse climate | R 2/04 | Groups assigned | Matt | R6 (121-136) |
| 5 | 9. From Greenhouse to Icehouse: The Last 50 Million Years (1) | T 2/09 |  | Matt | R7 (137-142); IPCC (318-369) |
| 10. From Greenhouse to Icehouse: The Last 50 Million Years (2) | R 2/11 |  | Matt | R7 (143-155); IPCC (370-376) |
| 6 | **Part III**  Orbital-Scale Climate Change | 11. Astronomical Control of Solar Radiation (1) | T 2/16 |  | Matt | R8 (156-164) |
| 12. Astronomical Control of Solar Radiation (2) | R 2/18 |  | Matt | R8 (165-176) |
| 7 | 13. Insolation Control of Monsoons | T 2/23 |  | Bryan | R9 (177-194) |
| 14. Insolation Control of Ice Sheets | R 2/25 |  | Bryan | R10 (195-214) |
| 8 | 15. Orbital-Scale Changes in Carbon Dioxide and Methane (1) | T 3/02 |  | Matt | R11 (215-220) |
| 16. Orbital-Scale Changes in Carbon Dioxide and Methane (2) | R 3/04 | Topic and Science questions due | Matt | R11 (221-232) |
| 9 | 17. Orbital-Scale Interactions, Feedbacks, and Unsolved Mysteries | T 3/09 |  | Bryan | R12 (233-250) |
| **MIDTERM EXAM** | R 3/11 |  |  | |
| 10 | **SPRING BREAK** | | T 3/16 |  |  | |
| R 3/18 |  |
| 11 | **Part IV** Glacial/Deglacial Climate Change | 19. The Last Glacial Maximum | T 3/23 |  | Bryan | R13 (251-272) |
| 20. Climate During and Since the Last Deglaciation | R 3/25 | Abstract due | Bryan | R14 (273-294) |
| 12 | 21. Millennial Oscillations of Climate | T 3/30 |  | Bryan | R15 (295-314) |
| **Part V** Historical and Future Climate Change | 22.Humans and Preindustrial Climate | R 4/01 |  | Bryan | R16 (315-334) |
| 13 | 23. Climate Changes During the Last 1,000 Years | T 4/06 |  | Bryan | R17 (335-356) |
| 24. Climatic Changes Since 1850 | R 4/08 |  | Matt | R18 (357-374) |
| 14 | 25. Causes of Warming over the Last 125 Years | T 4/13 |  | Matt | R19 (375-392) |
| 26. Future Climatic Change | R 4/15 |  | Bryan | R20 (393-409) |
| 15 | Group presentations | T 4/20 | Final project due |  | |
| R 4/22 |  |
| Final Exam | | | R 4/29 |  |  | |

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