

## **EARTH and SPACE SYSTEMS EVOLUTION**

CLIMATE/SPACE/EARTH 320 - Fall 2023

**Lectures:** 1:30 PM to 3:00 PM: Tuesday and Thursday

2246 Space Research Building, North Campus

### **Professors:**

Prof. ERIC A. KORT

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**Student IA's:** Tori Scheidt ([vscheidt@umich.edu](mailto:vscheidt@umich.edu)) & Brian Cromwell  
([bcrom@umich.edu](mailto:bcrom@umich.edu))

**Course Web site:** Canvas

### **COURSE DESCRIPTION**

CLIMATE/SPACE 320 is the first core course offered by the Department of Climate & Space (CLaSP) in the College of Engineering. The program will provide a basic understanding of the main concepts in Earth Science through a combination of lectures and quantitative analysis. The first half of the course will focus on the individual components of the Earth System (atmosphere, ocean, biosphere, solid earth) and the relevant chemical and physical properties. The second half of the course will focus on the evolution of the Earth's atmosphere and the Earth's climate from early geological time to the present. This is a fun course, but has an incredible breadth of topics (perhaps one of the reasons it is so much fun), so keeping up with the reading is essential for developing a strong foundation of the fundamentals of Earth System

Science. We will include discussions on learning and system science to help process and understand the course content.

The typical format for each class session begin with assigned textbook reading for each class meeting, one hour of lecture, followed by thirty minutes discussion, answering questions and solving problems.

*Attendance in class is expected.* If you are ill or have another valid reason to miss lecture in person, course capture recordings will be provided. Please notify the IA's via email if you will miss class with the explanation. Persistent absenteeism will negatively impact your grade.

As they have throughout the past two years, policies around academic and public health are subject to change. This course will follow all policies issued by the University, which are documented on the [Campus Blueprint's FAQ \(Links to an external site.\)](#). These policies may change over the course of the term, so please review the [Campus Blueprint's FAQ \(Links to an external site.\)](#) for the most up to date information.

## **LEARNING GOALS AND EXPECTATIONS**

ESS (Earth and Space Systems) is a survey course covering the physical understanding of the Earth, introduction to the system science approach, and further development of your meta-cognition and learning skills. We expect you to be engaged, curious, thoughtful, to ask questions and to be responsible, helpful and kind to your classmates and instructors.

**PREREQUISITES:** Generally, students should be conversant with basic chemistry concepts and simple chemical calculations, and elementary differential and integral calculus.

**REQUIRED TEXT:** Lee R. Kump, James F. Kasting, and Robert G. Crane, *The Earth System*, 3rd Ed. (Pearson/Prentice Hall 2010). ISBN-13 978-0-32-159779-3. Note that online versions are now available for lower costs. Book also referred to as KKC.

## **GRADING, EXAMINATIONS AND DUE DATES:**

<b>Weight</b>	<b>Type</b>	<b>Due Date/Date</b>
33.3%	Activities/Homework/Quizzes	Given w/ assignment
33.3%	Mid-Term Exam	12 October
33.3%	Final Exam	12 December 1:30-3:30pm

## **EXAMS**

The midterm and final exams must be taken at the stated time. No make-up exams will be given without a doctor's note or approval from the student's undergraduate advisor.

## **HOMEWORK PROBLEM SETS**

**Assignment Format:** All assignments will be submitted through Canvas. Please be prepared to provide show all equations used, explain the relevant symbols and constants, and show sample calculations if spreadsheets are used for detailed calculations.

**Grading Policy:** The actual weight of each question on the course grade will depend on the total number of homework questions assigned during the semester. Grades will be assessed based on approach to the problem, an explanation of methods and approaches, and correct solutions (when applicable).

**Late Policy:** Assignments are due at the beginning of class (1:30PM) on the specified due dates. Each day (or fraction of a day) the assignment is late, the assignment grade will be reduced by 20%.

**New, Drop Lowest Homework Grade:** Your lowest Homework score will be omitted from your final grade calculation. So you can choose to not submit 1 assignment due to any extenuating circumstance without asking us for permission and it will not impact your final grade. If you do all the assignments the lowest grade will be dropped.

## **Academic Integrity**

Homework questions and problem assignments will be performed and graded individually. You can work with other students on homework, but you must submit your own work. If you have worked with other students on the homework, you must note on your assignment who you worked with. Supporting documentation for homework may be requested by the IA or the

professor, so please be sure to save your work. All work in class must follow the [UM College of Engineering Honor Code \(Links to an external site.\)](#) – please be sure to review the relevant policies.

### **GenerativeAI** (chatGPT and similar)

Learning how to use AI functions such as ChatGPT is important for all of us. Used properly, ChatGPT can enhance our work; used improperly, it can border on plagiarism. If you have used ChatGPT on anything you submit for 320, please note you used the tool, include an explanation as to (1) what was your original prompt to the chatbot; (2) what are some examples of incorrect data that the chatbot provided to you; and, (3) how did you rework and revise so that your final document was both factually accurate and reflected your writing voice and style.

Midterm and Final exam are in person, closed computer, so the use of GenAI tools is not permitted for exams.

## **ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES**

Participants with special needs are strongly encouraged to talk to the instructor as soon as possible to gain maximum access to course information. All discussions will remain confidential. University policy is to provide, on a flexible and individualized basis, reasonable accommodations to students who have documented disability conditions (e.g., physical, learning, psychiatric, vision, hearing, or systemic) that may affect their ability to participate in course activities or to meet course requirements. Students with disabilities are encouraged to contact UM Services for Students with Disabilities (<https://ssd.umich.edu/> ([Links to an external site.](#))) and their instructor to discuss their individual needs for accommodations.

### **Need Help?**

A great web-resource designed to make things “easy” to find is <https://maizelink.umich.edu/> ([Links to an external site.](#)) ([Links to an external site.](#)) — everything from academics to well-being. Your instructors are also good resources for questions and discussion about M-STEM, U-M, college, and life. Below are some handy links to resources to save you know what to search for.

### **Funding:**

[Scholarships & Fellowships \(Links to an external site.\)](#)

[Emergency Funding for Graduate Students \(Links to an external site.\)](#)

[CoE Emergency Funding Request Form \(2020-2021\) \(Links to an external site.\)](#)

**Mental Health Support:**

[SilverCloud \(Links to an external site.\)](#)

[Michigan Engineering C.A.R.E. Center \(Links to an external site.\)](#)

[CAPS \(Links to an external site.\)](#)

**Academic Support:**

[Engineering Learning Center \(Links to an external site.\)](#)

[Science Learning Center \(Links to an external site.\)](#)

[Peer tutoring sites \(Links to an external site.\)](#)

[Sweetland Center for Writing \(Links to an external site.\)](#)

[Engineering Advising Center \(Links to an external site.\)](#)

Departmental Advising

**Technical Support:**

There is a university wide laptop loaner program: [Sites @ Home program \(Links to an external site.\)](#)

Students who have other technology needs should contact Olivia Gunther (ogunther) from the Office of Student Affairs.

**International Students:**

[The International Center's updates on the latest DHS guidance \(Links to an external site.\)](#)

International Center FAQ pages for both [newly admitted \(Links to an external site.\)](#) and [continuing \(Links to an external site.\)](#) students

**TENTATIVE COURSE OUTLINE (schedule may change)**

Week	Date	KKC Chapter	Topic
1	29 Aug	1	Earth System and Global Change
	31 Aug	2	Intro to Systems Theory.
2	5 Sept	2	Intro to Systems Theory.
	7 Sept	2	Daisyworld Retrospective.
3	12 Sept	3	Energy Balance.
	14 Sept	3	Energy Balance.
4	19 Sept	3	Energy Balance.
	21 Sept	4	Energy Balance & beyond
5	26 Sept	4	Atmospheric Circulation
	28 Sept		Atmospheric Circulation
6	3 Oct	5	Ocean Circulation
	5 Oct	5	Water Cycle

7	10 Oct	6	Water Cycle/Review
	12 Oct		<b>MIDTERM</b>
8	17 Oct		FALL BREAK
	19 Oct	8,9	Short Term Carbon Cycle & the Biosphere
9	24 Oct	8	Carbon Cycle – Short Term
	26 Oct	8	Carbon Cycle – Long Term
10	31 Oct	8	Carbon Cycle – Long Term
	2 Nov	10	Origin of the Earth
11	7 Nov	11	History of the Atmosphere
	9 Nov	17	Stratospheric ozone depletion
12	14 Nov	12,14	Faint Sun & Milankovitch.
	16 Nov	12,14	Climate – LONG Term.

13	21 Nov		NO CLASS
	23 Nov		THANKSGIVING
14	28 Nov	15,16	Climate – Short Term
	30 Nov	19	Earth & Earth-like Planets
15	5 Dec		Bonus Topic tbd
FINAL	12 Dec	1:30-3:30pm	Final Exam