

EARTH and SPACE SYSTEMS EVOLUTION

CLIMATE/SPACE/EARTH 320 - Fall 2021

Lectures: 1:30 PM to 3:00 PM: Tuesday and Thursday
2246 Space Research Building, North Campus

Professor:
Prof. ERIC A. KORT
2553 Space Research Building, North Campus
(e-mail: eakort@umich.edu)

Student IA's: Lydia Gilbert & Willa Tobin

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 unable to attend class (please stay home if sick), let Prof. Kort know by email and a link for course capture recording will be shared for that lecture.

As they have throughout the past year and a half, policies around academic and public health are subject to change as this pandemic evolves. 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:

Weight	Type	Due Date/Date
50%	Activities/Homework/Quizzes	Given w/ assignment
25%	Mid-Term Exam	14 October
25%	Final Exam	16 December 4-6pm

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%.

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.

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	31 Aug	1	Earth System and Global Change
	2 Sept	2	Intro to Systems Theory
2	7 Sept	2	Intro to Systems Theory
	9 Sept	2	Daisyworld Retrospective
3	14 Sept	3	Energy Balance
	16 Sept		NO CLASS (Yom Kippur)
4	21 Sept	3	Energy Balance
	23 Sept	3	Energy Balance
5	28 Sept	4	Atmospheric Circulation
	30 Sept	4	Atmospheric Circulation
6	5 Oct	5	Ocean Circulation
	7 Oct	5	Ocean Circulation
7	12 Oct	6	Water Cycle/Review
	14 Oct		MIDTERM
8	19 Oct		FALL BREAK – NO CLASS
	21 Oct	8,9	Short Term Carbon Cycle & the Biosphere
9	26 Oct	8	Carbon Cycle – Short Term
	28 Oct	8	Carbon Cycle – Long Term
10	2 Nov	8	Carbon Cycle – Long Term
	4 Nov	10	Origin of the Earth
11	9 Nov	11	History of the Atmosphere
	11 Nov	17	Stratospheric ozone depletion
12	16 Nov	12,14	Faint Sun & Milankovitch
	18 Nov	12,14	Climate – LONG Term
13	23 Nov		NO CLASS
	25 Nov		THANKSGIVING
14	30 NOV	15,16	Climate – Short Term
	2 Dec	19	Earth & Earth-like Planets
15	7 Dec		Bonus Topic
	9 Dec		Review
FINAL	16 Dec	4-6pm	Final Exam