Advanced Environmental Systems
Geographical Sciences 301
Spring 2021
Syllabus – Version 1.0

Instructors	Dr. Sinéad L. Farrell	Yuhao Wang (TA)
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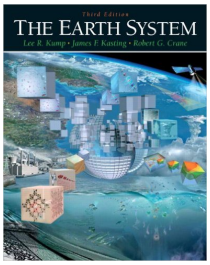
Classes (recorded)	Tu 12:30 – 1:45 pm Th 12:30 – 1:45 pm	Zoom online
Office Hours	Tu 2:30 – 3:00 pm Th 10:30 – 11:00 am Th 3:15 – 3:45 pm	M 1:00 – 1:45 pm W 11:00 – 11:45 am

I. Course Text



We are using *The Earth System*, 3rd edition, by Kump, Kasting & Crane (**ISBN:** 9780321597793). The 2nd edition will work as well (especially if you can find it cheaper). Students may also find it useful to have a copy of an introductory physical geography text, such as *Physical Geography*, 5th edition, by Mason, Burt, Muller & DeBlij (ISBN: 9780190246860).

II. Course Description

GEOG301 is an advanced course in Environmental Systems, with emphasis in physical geography and Earth System Science. The major goal of this class is to provide a fundamental understanding of physical aspects and dynamics of the Earth as a system. GEOG301 builds on the material covered in GEOG201. The class explores how the Earth as a system is changing, both in the past and present, and how it may look in the future. This course will provide students with an overview of the key elements of physical geography, including the circulation of the atmosphere and ocean, biogeography (factors and processes that control the geographical distributions of plants and animals), climatology (processes associated with controlling variations in weather and climate), and geomorphology (factors and processes that control changes to the physical structure of the earth surface in relation to geological structures). The primary course material was created by Dr. Ralph Dubayah, Dr. George Hurtt, and Donal O'Leary.

III. Course Organization

The course is organized around eight major topics: (1) Global Energy Balance and the Greenhouse Effect, which covers how the atmosphere and solar radiation interact; (2) Atmospheric Circulation - Water, Weather and Climate, which covers how the energy balance of the Earth interacts with the atmosphere and hydrosphere to produce climate and weather; (3) The Hydrosphere – Ocean Circulation, which covers how the atmosphere and oceans interact; (4) The Cryosphere – Permafrost, seasonal snow, land ice, glaciers and sea ice, which covers how cryospheric processes influence the Earth system; (5) The Biosphere - Ecosystems, including carbon and nutrient cycling, biodiversity, and the interaction of biosphere with other Earth systems; (6) The Geosphere – Plate tectonics, earthquakes, volcanism, weathering and mass movement, which covers how geohazards shape earth's surface and interior; (7) Climate Change, past, present and future, and the impacts of humans on the Earth system; (8) Monitoring the Earth System, including examples to illustrate integrative approaches scientists use to observe the Earth system from space.

Lectures

Lectures consist of material presented verbally through synchronous online lectures, accompanied by projected graphics. The slide deck for each lecture will be available on ELMS-Canvas approximately 24 hours prior to the lecture. Instructors do not however make their lecture notes available. The course text book is meant to provide background to the lectures and each lecture is accompanied by a chapter of the textbook. While lectures cover some key concepts in the text, many new concepts are also presented only through lecture material. Supplemental reading material is also assigned throughout the course.

Students may participate in online lectures using a cell phone, tablet or laptop, or they may dial-in using a telephone. The instructors are available to assist with any technical difficulties that arise during the semester. The online nature of this class will push you to take an active role in the learning process. You will do this by engaging and collaborating with other students and the instructor on a regular basis both, in live sessions, as well as through group work and activities, and during office hours. Recordings of each lecture will be made promptly available following class through ELMS-Canvas and Panopto. There will be no penalty for any students unable to join a live lecture for personal or other reasons. Students must watch the recording of any lectures they were unable to attend in person.

Collaboration

Throughout the semester, students will be asked to interact in a collaborative fashion during class. Please be considerate of your classmates and instructors. Always interact with respect and collegiality. There will be a collaboration activity in the second half of the semester based around a group project. Projects are on the topic of Earth Observation and individual projects will be assigned to each collaboration team. Further details will be made available in April. The collaborative activity is designed for students to work with their collaboration team on the group project. Each student will submit one final project and will be asked to present one slide to the rest of the class as part of their group project. Students will receive individual scores on these activities.

Learning Outcomes

1. To understand the fundamental laws and principles underlying the physical environment, how these control processes that occur on the land surface, in the oceans and in the atmosphere, and how these systems interact.
2. To understand the mechanisms that lead to variability in important physical characteristics such as air temperature, weather, climate, plants and other elements of the environment.
3. To describe the key components, interactions and concepts that characterize the modern Earth system.
4. To understand the causes of change in the Earth system across temporal and spatial scales.
5. To understand human impacts on Earth systems, and to have a quantitative comprehension of the role of these impacts on climate and biological resources.
6. To understand approaches for monitoring and modeling the Earth system using remote sensing, computer models, and other data.
7. To understand contemporary issues surrounding climate change and loss of biodiversity.

IV. Course Requirements

Attendance is not required for this course. However, in-class participation, discussion, activities, assessments and collaborative exercises are required and graded. We strongly suggest that students attend every lecture. Students must watch the recording of any lectures they were unable to attend in person.

There will be *four graded homework assignments* during this course. The schedule for these assignments will be released on ELMS-Canvas. Homework assignments will be due approximately one week after they are assigned. Students may refer to the lecture slides and course textbook to complete assignments, and may work together on assignments. The final work however *must* be the student's own (i.e., course work should be in your own words, with your own drawings, and using your own calculations and must show your own work). Presenting anyone else's work as your own, even if conducted collaboratively, will be considered academic dishonesty. No late assignments will be accepted, except as allowed under University regulations, and with *prior permission*.

We will have *six graded multiple-choice quizzes*, that are strictly time-limited. No extension beyond the due date/time of the quiz is available. *This means that quizzes must be started at least 10 minutes prior the due date/time*. There will be no exceptions to the quiz deadline. Any student unable to complete the quiz before the due date/time will have their score recorded at the time of the quiz deadline.

We will have *one graded midterm exam* that will be a mix of multiple-choice, fill in the blank, short answer/diagram, and longer answer formats. The midterm exam will be completed online in ELMS-Canvas. The exam is in open-book format, and can be completed during class on March 11, 2021 or at any time during spring break. Students may refer to the lecture slides and course textbook to complete the midterm exam. *The exam is strictly time-limited*. No extension beyond the due date/time of the midterm is available. *This means that the midterm must be started at least 60 minutes prior to the due date/time*. There will be no exceptions to the midterm deadline. Any student unable to complete the midterm before the due date/time will have their score recorded at the time of the deadline.

There will *one* graded *group project* in the second half of the semester on the topic of Earth Observation. Students will be assigned to a collaboration team. Each team will be assigned an individual project. The collaborative activity is designed for students to work together with their collaboration team on the group project. Each student will submit one final project and will be asked to present one slide to the rest of the class as part of their group project. Students will receive individual scores on this activity.

V. Course Grading

Course grades will be determined as the sum of the weighted scores of in-class activities and assessments, homework, group assignments, quizzes and the midterm exam. There will be no final exam in Spring 2021. We curve the final, cumulative points earned (not individual elements of the grade). We will use the plus/minus grading system. Detailed information about the grading policies in spring 2021 is available at **https://ugst.umd.edu/keeplearning**

Assigned Problem Sets	**30%**
Midterm Exam	**25%**
Multiple-choice Quizzes	**15%**
Collaborative Exercise & Final Project	**30%**

VI. Course Prerequisites

Students must have completed GEOG201 and GEOG211, or their equivalent (with permission of the instructors), before taking GEOG301. Concurrent enrollment in GEOG201/211 and GEOG301 is *not* allowed. Students will not receive credit for GEOG301 if they have taken GEOG398B. Students are also expected to know simple high school algebra, and how to use a scientific calculator (either as a device or in software emulation).

VII. Course Related Policies

The University expects each student to take full responsibility for their academic work and academic progress. GEOG301 follows all University of Maryland course related polices for undergraduate students with regards to areas such as academic integrity, classroom conduct, attendance, absences, missed assignments, and complaints about grading, among others. The complete list of these policies governing our course is located here: Course Related Polices.
For guidance and resources to help with the remote learning environment, please visit https://ugst.umd.edu/keeplearning/. This provides resources for students, and includes links to other resources, all in one place. Stay connected with the UMD community: https://umd.edu/4Maryland.

Tips for Success in an Online Course

1. **Participate.** Discussions and group work are a critical part of the course. You can learn a great deal from discussing ideas and perspectives with your peers and professor. Participation can also help you articulate your thoughts and develop critical thinking skills.
2. **Manage your time.** Make time for your online learning and participation in discussions and office hours. Give yourself plenty of time to complete assignments including extra time to handle any technology-related problems.
3. **Login regularly.** Log in to ELMS-Canvas several times a week to view announcements, discussion posts and replies to your posts. You may need to log in multiple times a day when group submissions are due.
4. **Do not fall behind.** This class moves at a quick pace and each week builds on the previous. It will be hard to keep up with the course content if you fall behind.
5. **Use ELMS-Canvas notification settings.** Canvas ELMS-Canvas can ensure you receive timely notifications in your email or via text. Be sure to enable announcements to be sent instantly or daily.
6. **Ask for help if needed.** If you need help with ELMS-Canvas or other technology, contact DIT Support. If you are struggling with a course concept, reach out to the instructors, and your classmates, for support. Attend office hours.

VIII. Course Schedule†

Lecture	Chapter to Read	Date	Topic
Origins: The Earth - Sun System			
1	1	Tuesday, January 26, 2021	Class Introduction: The Earth System
2	10	Thursday, January 28, 2021	Origins of the Earth and Life on Earth
Section I: Global Energy Budget and Greenhouse Effect			
3	3	Tuesday, February 2, 2021	Radiation and Radiation Laws
4	3	Thursday, February 4, 2021	Planetary Energy Balance Models
5	3	Tuesday, February 9, 2021	Atmospheric Structure and the Greenhouse Effect
6	3	Thursday, February 11, 2021	Greenhouse Gases
7	3	Tuesday, February 16, 2021	Global Energy Budget
Section II: Atmospheric Circulation			
8	4	Thursday, February 18, 2021	Hydrologic Cycle and Atmospheric Moisture
9	4	Tuesday, February 23, 2021	Adiabatic Processes
10	4	Thursday, February 25, 2021	General Atmospheric Circulation
11	4	Tuesday, March 2, 2021	Atmospheric Pressure and Winds
Section III: The Oceans			
12	5	Thursday, March 4, 2021	Global Ocean Circulation
13	5	Tuesday, March 9, 2021	Oceans and Climate
		Thursday, March 11, 2021	**Midterm Exam**
SPRING BREAK			
Section IV: The Cryosphere			
14	6	Tuesday, March 23, 2021	Introduction to the Cryosphere
15	6	Thursday, March 25, 2021	Cryosphere Guest Lecture
Section V: The Biosphere			
16	8	Tuesday, March 30, 2021	Nutrient Cycles
17	9	Thursday, April 1, 2021	Ecosystems and Biodiversity
18	11	Tuesday, April 6, 2021	Effects of Life on the Atmosphere
Section VI: The Geosphere			
19	7	Thursday, April 8, 2021	The Dynamic Earth
20	7	Tuesday, April 13, 2021	Geohazards
Section VII: Climate Change			
21	14	Thursday, April 15, 2021	Climate Change: Past & Present
22	15	Tuesday, April 20, 2021	Feedbacks and Future Climate
23	15	Thursday, April 22, 2021	Group Assignments for Final Project
24	16	Tuesday, April 27, 2021	Climate Change Mitigation
Section VIII: Earth Observation			
25		Thursday, April 29, 2021	Introduction to Earth Observation
26		Tuesday, May 4, 2021	Earth Observation: Collaborative Group Projects
27		Thursday, May 6, 2021	Earth Observation: Collaborative Group Projects
		Tuesday, May 11, 2021	**Final Presentations**

†Course schedule may be revised in class and via ELMS-Canvas by instructors during the semester.