UNIVERSITY OF MARYLAND

Course Information

Course Title: Polar Remote Sensing
Course Number: AOSC440/GEOG440
Term: Fall 2021
Credits: 3
Course Dates: From Aug 30, 2021 - Dec 13, 2021
Course Times: MWF 1:00 – 1:50 PM

Professor: Sinead L. Farrell
Pronouns: she/her/hers
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Office Hours: TBD & in-person appointments
Classroom: Online

Course Description

The harsh environment of the vast polar regions makes them some of the most inaccessible places on Earth. With widespread environmental change already underway, satellite remote sensing is the best way to obtain year-round observations of the polar climate system. The objective of this course is to provide students with an overview of polar remote sensing techniques, including the physical principles of active and passive sensors, orbits, electromagnetic radiation, atmospheric transmission, calibration and validation. We will focus on measurements of the polar oceans, sea ice, glaciers, ice sheets, snow and permafrost, and examine the response of the cryosphere to climate change.

Learning Outcomes

After successfully completing this course, you will:

- Be able to articulate the role of the polar regions (i.e., the cryosphere) in Earth's climate system

- Understand the basic physical principles of satellite remote sensing

- Know the techniques and sensors used to observe the Earth's land ice and sea ice

- Be exposed to key remote sensing applications in polar climate science

- Be able to evaluate the current state of knowledge provided by satellite observations

- Be prepared to discuss and share knowledge about remote sensing observations of contemporary changes in the polar climate system

Required Resources

- Course Website: elms.umd.edu

- Course Textbook: *An Introduction to Ocean Remote Sensing*, 2nd Edition (**ISBN**: 9781139094368) by Seelye Martin, Cambridge University Press, 2014. **DOI**: https://doi.org/10.1017/CBO9781139094368.

- Additional reading on the polar climate system and current satellite missions will be assigned during class.

Course Prerequisites

Students must have completed PHYS171, PHYS161, GEOG276 or GEOG301, or with permission of instructor. Students are expected to know algebra and how to use a scientific calculator. There is one homework that requires basic knowledge of Python and the instructions are provided in a Jupyter Notebook.

Course Structure

This course comprises live lectures and discussion sessions via Zoom. The flexible framework does not require you to be in a specific location to participate; students may participate in online lectures using a tablet, laptop or cellphone or they may dial-in using a telephone. 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. Attendance of the lectures is not required but it is strongly encouraged for this course. Students must watch the recording of any lectures they were unable to attend in person. Recordings will be made available through ELMS-Canvas Panopto. Attendance for in-class activities, such as discussions and group collaborative work, _is_ required/mandatory and it _is_ graded. These specific classes will be identified on the class schedule.

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 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.

Collaboration and Group Work

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. Collaborative activities are designed for students to learn to work together as a team. A major collaboration activity is planned for the second half of the semester and is based around a term project, on the topic of Earth Observation. The term project is a group activity and students will be assigned to collaboration teams. Further details will be made available on ELMS-Canvas. Each student will submit one final written project report and will give a short presentation to the rest of the class on their project, thereby improving both their written and oral communication skills.

Course Guidelines

Academic Integrity for Polar Remote Sensing

For this course, some of your assignments will be collected ELMS-Canvas page. AOSC440/GEGO440 follows all University of Maryland course related polices for undergraduate students with regards to academic integrity

Course Related Policies

The University expects each student to take full responsibility for their academic work and academic progress. AOSC440/GEOG440 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.

Communication with the Instructor

Salutation: Please refer to me as Dr. Farrell.

Email: If you need to reach me, please reach out by email at sineadf@umd.edu. You may email me about academic and intellectual concerns/questions, to schedule a meeting outside of office hours, or to alert me to a scheduled absence, illness or other issue that may impact your progress. I will do my best to respond to emails within 24 hours.

ELMS-Canvas Announcements: I will send all course announcements via ELMS messaging. You must make sure that your email & announcement notifications (including changes in assignments and/or due dates) are enabled in ELMS so you do not miss any messages. You are responsible for checking your email and ELMS-Canvas inbox frequently.

Names/Pronouns and Self-Identifications

The University of Maryland recognizes the importance of a diverse student body, and we are committed to fostering inclusive and equitable classroom environments. I invite you, if you wish, to tell us how you want to be referred to both in terms of your name and your pronouns (he/him, she/her, they/them, etc.). The pronouns someone indicates are not necessarily indicative of their gender identity. Visit trans.umd.edu to learn more. Additionally, how you identify in terms of your gender, race, class, sexuality, religion, and dis/ability, among all aspects of your identity, is your choice whether to disclose (e.g., should it come up in classroom conversation about our experiences and perspectives) and should be self-identified, not presumed or imposed. I will do my best to address and refer to all students accordingly, and I ask you to do the same for all of your fellow Terps.

Communication with Peers

With a diversity of perspectives and experience, we may find ourselves in disagreement and/or debate with one another. As such, it is important that we agree to conduct ourselves in a professional manner and that we work together to foster and preserve a virtual classroom environment in which we can respectfully discuss and deliberate controversial questions.

I encourage you to confidently exercise your right to free speech—bearing in mind, of course, that you will be expected to craft and defend arguments that support your position. Keep in mind, that free speech has its limit and this course is not the space for hate speech, harassment, and derogatory language. I will make every reasonable attempt to create an atmosphere in which each student feels comfortable voicing their argument without fear of being personally attacked, mocked, demeaned, or devalued.

Any behavior (including harassment, sexual harassment, and racially and/or culturally derogatory language) that threatens this atmosphere will not be tolerated. Please alert me immediately if you feel threatened, dismissed, or silenced at any point during our semester together and/or if your engagement in discussion has been in some way hindered by the learning environment.

Netiquette Policy

Netiquette is the social code of online classes. Students share a responsibility for the course's learning environment. Creating a cohesive online learning community requires learners to support and assist each other. To craft an open and interactive online learning environment, communication has to be conducted in a professional and courteous manner at all times, guided by common sense, collegiality and basic rules of etiquette.

Participation

- Given the interactive style of this class, attendance will be crucial to note-taking and thus your performance in this class. Attendance is particularly important also because class discussion will be a critical component for your learning.
- Each student is expected to make substantive contributions to the learning experience, and attendance is expected for every collaborative session.
- Students with a legitimate reason to miss a live lecture should communicate in advance with the instructor, except in the case of an emergency.
- Students who miss a live lecture are responsible for learning what they miss by watching the recorded lecture.
- Additionally, students must complete all readings and assignments in a timely manner in order to fully participate in class.

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 each week. 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 in the pre-work or post-work.
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, IT Support. If you are struggling with a course concept, reach out to me, and your classmates, for support.

Major Assignments

Homework Assignments
There will be *six 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 reading reflections, 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*.

Participation & Engagement in Class Discussions
There will be *four graded discussion assignments* during this course. The schedule for these assignments will be released on ELMS-Canvas and will be completed during live sessions. Students will be assigned to a discussion group and this collaborative activity is designed for students to work together as a team. Each team will be assigned a set of peer-reviewed journal papers and/or topical science articles to read, evaluate, and summarize during class.

Midterm Exam
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 is (either, TBD later) closed book and can be completed during class. Students may refer to the lecture slides and course textbook to complete the midterm exam. No extension beyond the due date/time of the midterm is available. 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.

Term Project
There will be *one graded term project* in the second half of the semester on the topic of Earth Observation of the polar regions. Students will be assigned to a collaboration team, and each team will be assigned a group project. Each student will submit one final written project (1500-2000 words, and not more than 10 pages in total incl. figures and references). Each student/team will be asked to present approximately four-five slides to the rest of the class as part of their term project. Students will receive individual scores on this activity. No extension beyond the due date/time of the term project is available.

Course Outline

Week #	Topic	Readings
1	Introduction to the polar regions and their importance in the climate system	SROC Report; Arctic Report Card; BAMS State of the Climate Report.
2	Introduction to remote sensing techniques. Definition, active/passive sensors, satellite orbits	Chapter 1
3	EM radiation and atmospheric transmission	Chapters 3, 4, 5
4	Sensors and Instruments 1 (optical, passive microwave radiometers, gravimetry)	Chapters 7, 8, 9, 14
5	Sensors and Instruments 2 (altimeters, scatterometers, imaging radars)	Chapters 10, 11, 12, 13, 14
6	Applications: Sea Ice Extent/Concentration	Assigned readings
7	Applications: Sea Ice Thickness/Drift/Age	Assigned readings
8	Applications: Ice Sheet Mass Balance/Loss/Melt	Assigned readings
9	Applications: Ice Sheet Melt and Super/supraglacial Lakes	Assigned readings
10	Applications: Ice Sheet Dynamics and Ice Shelves	Assigned readings
11	Applications: Polar Oceans (SST, Color, SLR)	Chapters 2, 6, 7
12	Applications: Polar Atmosphere (Air Temps, Winds)	Chapter 2
13	Calibration and Validation of Satellite Data	Assigned reading
14	Data Systems and Archives; Emerging Technologies	Chapter 1

Note: This is a tentative schedule, and subject to change as necessary – monitor the course pages on ELMS-Canvas for the most up-to-date schedule and deadlines. In the unlikely event of a prolonged university closing, or an extended absence from the university, adjustments to the course schedule, deadlines, and assignments will be made based on the duration of the closing and the specific dates missed.

Grading Structure

Assignment	Percentage %
Homework	30%
Participation/Engagement in Class Discussions	20%
Midterm Exam	20%
Term Project/Presentation	30%
Total	100%

Grades
All assessment scores will be posted on the course ELMS-Canvas page. If you would like to review any of your grades (including the exams), or have questions about how something was scored, please email me to schedule a time for us to discuss this. Late work will not be accepted for course credit so please plan to have it submitted well before the scheduled deadline. If you experience an unavoidable circumstance for which you may need an extension, please contact me to discuss this. Detailed information about the grading policies in Fall 2021 is available at **https://ugst.umd.edu/keeplearning**.

Final Grade Cutoffs									
+	97.00%	+	87.00%	+	77.00%	+	67.00%	+	
A	94.00%	B	84.00%	C	74.00%	D	64.00%	F	<60.0%
-	90.00%	-	80.00%	-	70.00%	-	60.00%	-	

UMD Policies and Resources for Undergraduate Courses

It is our shared responsibility to know and abide by the University of Maryland's policies that relate to all courses, which include topics like:
- Academic integrity
- Student and instructor conduct
- Accessibility and accommodations
- Attendance and excused absences
- Grades and appeals
- Copyright and intellectual property

Please visit www.ugst.umd.edu/courserelatedpolicies.html for the Office of Undergraduate Studies' full list of campus-wide policies and follow up with me if you have questions.

Academic Integrity
The University's **Code of Academic Integrity** is designed to ensure that the principles of academic honesty and integrity are upheld. In accordance with this code, the University does not tolerate academic dishonesty. Please ensure that you fully understand this code and its implications because all acts of academic dishonesty will be dealt with in accordance with the provisions of this code. All students are expected to adhere to this Code. It is your responsibility to read it and know what it says, so you can start your professional life on the right path. **As future professionals, your commitment to high ethical standards and honesty begins with your time at the University of Maryland**

It is important to note that course assistance websites, such as CourseHero, are not permitted sources. Material taken or copied from these sites can be deemed unauthorized material and a violation of academic integrity. These sites offer information that might not be accurate and that shortcut the learning process, particularly the critical thinking steps necessary for college-level assignments. Please visit the **Office of Undergraduate Studies' full list of campus-wide policies** and follow up with me if you have questions.

UMD Resources & Accommodations

Accessibility and Disability Services
The University of Maryland is committed to creating and maintaining a welcoming and inclusive educational, working, and living environment for people of all abilities. The University of Maryland is also committed to the principle that

no qualified individual with a disability shall, on the basis of disability, be excluded from participation in or be denied the benefits of the services, programs, or activities of the University, or be subjected to discrimination. The **Accessibility & Disability Service (ADS)** provides reasonable accommodations to qualified individuals to provide equal access to services, programs and activities. ADS cannot assist retroactively, so it is generally best to request accommodations several weeks before the semester begins or as soon as a disability becomes known. Any student who needs accommodations should contact me as soon as possible so that I have sufficient time to make arrangements.

For assistance in obtaining an accommodation, contact Accessibility and Disability Service at 301-314-7682, or email them at **adsfrontdesk@umd.edu**. Information about **sharing your accommodations with instructors**, **note taking assistance** and more is available from the **Counseling Center**.

Student Resources and Services

Taking personal responsibility for your own learning means acknowledging when your performance does not match your goals and doing something about it. I hope you will come talk to me so that I can help you find the right approach to success in this course, and I encourage you to visit **UMD's Student Academic Support Services website** to learn more about the wide range of campus resources available to you.

In particular, everyone can use some help sharpening their communication skills (and improving their grade) by visiting **UMD's Writing Center** and schedule an appointment with the campus Writing Center.

You should also know there are a wide range of resources to support you with whatever you might need (**UMD's Student Resources and Services website** may help). If you feel it would be helpful to have someone to talk to, visit **UMD's Counseling Center** or **one of the many other mental health resources on campus**.

Basic Needs Security

If you have difficulty affording groceries or accessing sufficient food to eat every day, or lack a safe and stable place to live, please visit **UMD's Division of Student Affairs website** for information about resources the campus offers you and let me know if I can help in any way.

Course Evaluation

Please submit a course evaluation through CourseEvalUM in order to help faculty and administrators improve teaching and learning at Maryland. All information submitted to CourseEvalUM is confidential. Campus will notify you when CourseEvalUM is open for you to complete your evaluations for fall semester courses. Please go directly to the **Course Eval UM website** to complete your evaluations. By completing all of your evaluations each semester, you will have the privilege of accessing through Testudo, the evaluation reports for the thousands of courses for which 70% or more students submitted their evaluations.

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