UNIVERSITY OF MARYLAND

Course Information

Course Title: Polar Remote Sensing
Course Number: AOSC440/GEOG440/AOSC642
Term: Fall 2023
Credits: 3
Course Dates: 29 Aug. – 7 Dec., 2023
Course Times: **TuTh. 11:00 AM – 12:15 PM**

Professor: Sinead L. Farrell
Pronouns: she/her/hers
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Office Hours: TBD
Classroom: ATL2428

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 only 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 and ice sheets 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 Earth's sea ice and land ice
- Be exposed to key remote sensing methods and applications in polar climate science
- Be able to evaluate the current state of scientific 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
- Journal articles, community reports and national/international assessments on the polar climate system and current satellite missions will be assigned throughout the semester.
- Course Textbook (optional, but recommended):

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

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.

Course Guidelines

Course Structure

This course comprises ***in-person*** lectures, discussion sessions and in-class activities. The structure of this class will push you to take an ***active*** role in the learning process. You will do this by collaborating with other students and the instructor on a regular basis both through the lectures, as well as through group work and activities. Attendance at lectures is ***strongly encouraged*** for this course. Students unable to attend class in person due to an excused absence or emergency ***must watch*** the recorded lecture as soon as is feasible. Recordings will be made available through ELMS-Canvas Panopto.

NOTE: ***Attendance for in-class activities, including the mid-term exam and group collaborative work, is required (mandatory) and it is graded. These classes are identified on the class schedule at the beginning of the semester.***

Lectures

Slides to accompany each lecture will be available on ELMS-Canvas prior to the lecture. All lectures are recorded and posted to ELMS-Canvas Panopto several hours after class. Instructors do not however make their lecture notes available. The course text book is *optional* and meant to provide background to the lectures. While lectures cover some key concepts in the text, many new concepts are presented through the lecture material only. 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 that reflects the approach now taken in many scientific labs and institutes. A polar research project is planned for the second half of the semester and is based around a term project on Polar Remote Sensing. ***Students enrolled at the 440-level, will conduct the term project as a group activity*** and students will be assigned to teams of approximately 4-5 students. ***Students enrolled at the 642-level, will conduct the term project as an individual activity which they must complete independently***. Further details will be made available during the semester 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.

Academic Integrity for Polar Remote Sensing

All assignments are to be submitted electronically by the stated deadline through ELMS-Canvas.

Course Related Policies

The University expects each student to take full responsibility for their academic work and academic progress. AOSC440/GEOG440/AOSC642 follows University of Maryland course related polices with regards to areas such as academic integrity, classroom conduct, attendance, absences, missed assignments, and complaints about grading, among others. The complete list of policies governing our course is located here: Course Related Polices.

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 because class discussion is a critical component for your learning.
- Each student is expected to make substantive contributions to the learning experience, and attendance is expected for ***ALL*** collaborative sessions. **Attendance is required for the in-class midterm examination**.
- Students with a legitimate reason to miss class should communicate in advance with the instructor, except in the case of an emergency.
- Students who miss class are responsible for learning what they miss by watching the recorded lecture.
- Additionally, students must complete all readings and assignments in a timely manner to fully participate in class.

Course Communications

Communication with the Instructor

Salutation: Dr. Farrell. **Email**: If you need to reach me, please email me at: sineadf@umd.edu

***Always* include AOSC440 / GEOG440 / AOSC642 in the subject line and use the appropriate salutation**. 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.

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, it is important that we conduct ourselves in a professional manner and that we work together to foster and preserve a classroom environment in which we can have respectful discussions. I encourage you to 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.

Major Assignments

Homework Assignments

There will be ***three* graded homework assignments** and ***four* multiple-choice quizzes** during this course. **At the 440-level**, there are also ***three* graded reading assignments**. Students will be assigned peer-reviewed journal articles on topics related to polar remote sensing and will need to read, evaluate and summarize the article in a short, survey-type questionnaire. **At the 642-level**, students will themselves be expected to select ***one*** relevant peer-reviewed journal article on a topic related to polar remote sensing. They will need to read, evaluate and summarize the main points of the article ***and*** be prepared ***to lead one class discussion*** on the article using a powerpoint slide set.

The schedule for these assignments will be released on ELMS-Canvas. Homework / reading assignments will be due on *Tuesdays*, one week after they are assigned. Students may refer to the lecture slides and the 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 use your own calculations and must show your own work, be in your own words, with your own reading reflections, your own drawings, graphs, schematics). Presenting anyone else's work as your own, even if conducted collaboratively, will be considered academic dishonesty.

NOTE: *No late assignments will be accepted, except as allowed under university regulations, and with prior permission.*

Midterm Exam

We will have ***one graded midterm exam*** that will have several multi-part questions that will be a mix of short answer/diagram and longer answer formats, with some mathematical calculations. ***The midterm exam is to be completed during class on 12th October 2023***. No extension beyond the due date/time of the midterm is available. Any student unable to complete the midterm by the due date/time will have their score recorded at the time of the deadline. You are required to bring a mathematical calculator with you to answer the math components.

Term Project

There will be ***one graded term project*** in the second half of the semester on remote sensing of the polar regions. The term project is in lieu of a final exam***. Students enrolled at the 440-level*** will be assigned to a ***collaboration team*** of 4-5 people, and in consultation with the instructor, each team will select ***a topic for their group project***. ***Students enrolled at the 642-level*** will complete an ***independent term project*** and they will be expected to select a relevant topic related to the lecture material on polar remote sensing. Each team/student will ***present*** their final project to the rest of the class during the last week of the semester, during which all students will be expected to present their powerpoint slides. Each student will submit ***one final written term paper*** (1,500 – 2,000 words, and not more than 10 pages in total including all figures and references). Students will receive individual scores on this activity. No extension beyond the due date/time of the term project is available.

Due dates/time: All due dates and times for homework assignments will be indicated on ELMS-Canvas.

Grading Structure

Assignment	Percentage %
Homework Assignments	**25%**
Reading Assignments	**20%**
Multiple-choice Quizzes	**10%**
Midterm Exam	**20%**
Term Project (Term Paper + Presentation)	**25%**
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 exam), or have questions about how something was scored, please attend office hours or 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 all assignments 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.

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%	-	

Course Outline

Week	Lecture #	Date	Topic	Background Reading
1	1	Tuesday, August 29, 2023	Welcome and Introduction to Remote Sensing	Chapter 1
	2	Thursday, August 31, 2023	Polar Climate System - Part 1	SROC Report
2	3	Tuesday, September 5, 2023	Polar Climate System - Part 2	SROC Report
	4	Thursday, September 7, 2023	Polar Oceans and Atmosphere - Part 1	Chapter 2
3	5	Tuesday, September 12, 2023	Polar Oceans and Atmosphere - Part 2	
	6	Thursday, September 14, 2023	Scientific Reading	
4	7	Tuesday, September 19, 2023	Sensors and Atmospheric Transmission	Chapter 3
	8	Thursday, September 21, 2023	Earth's Gravity and Satellite Orbits	Chapter 1
5	9	Tuesday, September 26, 2023	Passive Microwave Radiometers	Chapter 8
	10	Thursday, September 28, 2023	Sea Ice Concentration, Greenland Surface Melt	Chapter 9
6	11	Tuesday, October 3, 2023	Satellite Altimetry	Chapter 12
	12	Thursday, October 5, 2023	Sea Ice and Land Ice Thickness	Chapter 14
7	13	Tuesday, October 10, 2023	Ice Dynamics and Volume Loss	
		Thursday, October 12, 2023	**Mid Term Exam (in class)**	**Midterm**
8	14	Tuesday, October 17, 2023	Optical Imagers	Chapter 7
	15	Thursday, October 19, 2023	Ice Floes, Leads, Polynyas, Surface melt	
9	16	Tuesday, October 24, 2023	Radar Imagers	Chapter 13
	17	Thursday, October 26, 2023	Icebergs, Rifts, Calving, Marginal Ice Zone	
10	18	Tuesday, October 31, 2023	Introduction to Final Projects	
	19	Thursday, November 2, 2023	Data Systems and Data Archives	
11		**Tuesday, November 7, 2023**	**Group Project Meeting 1; In class**	**Project Related Literature Review**
		Thursday, November 9, 2023	**Group Project Meeting 2; In class**	
12	20	Tuesday, November 14, 2023	Calibration and Validation Techniques	
	21	Thursday, November 16, 2023	Emerging Technologies	
13		**Tuesday, November 21, 2023**	**Group Project Meeting 3; Online w/ breakout rooms**	**Project Related Literature Review**
		Thursday, November 23, 2023	No Class - Thanksgiving Break	
14	22	**Tuesday, November 28, 2023**	**Guest Lecture Online**	**Guest Lecture**
	23	**Thursday, November 30, 2023**	**Course Wrap-up. Group Project Presentations**	
15	-	**Tuesday, December 5, 2023**	**Group Project Presentations**	
	-	**Thursday, December 7, 2023**	**Group Project Presentations**	

Notes: This is a draft schedule, and subject to change as necessary! Please monitor the course pages on ELMS-Canvas for the most up-to-date schedule and deadlines. **Classes highlighted in blue, with bold font, are mandatory and all students must attend these sessions (two of which will be online over zoom)**. 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.

Tips for Success

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 the professor. Participation can also help you articulate your thoughts and develop critical thinking skills.
2. **Manage your time.** Make time for your learning. Give yourself plenty of time to complete assignments including extra time to attend office hours and to handle any technology related problems.
3. **Login regularly.** Log in to ELMS-Canvas several times a week to view announcements and read posted material.
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 with lectures and/or assignments.
5. **Use ELMS-Canvas notification settings.** 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.** Attend office hours with your instructor. If you are struggling with a course concept, reach out to me, the TA, and your classmates, for support.

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.

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.**

NOTE: Course assistance websites, such as CourseHero, are not permitted sources. Material taken or copied from these sites or the use of artificial intelligence (AI) tools can be deemed unauthorized material and a violation of academic integrity since 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 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 any 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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