



COURSE OUTLINE

Remote Sensing of the Environment using Active Sensors

Lecture: David Strong Building C108 | 10:30am-11:20am Tuesdays and Wednesdays

Labs: DTB A253 Tuesdays (2:30pm-4:20pm) or Thursdays (8:30am-10:20am)

Contact: atavri@uvic.ca or during office hours every **Wednesday from 1 to 2pm or by appointment**
Office hours will be held via Zoom (more details in class)

COURSE DESCRIPTION

The objective of this course will be to introduce you to the idea of collecting, processing, and using passive microwave, active microwave (RADAR), and LiDAR remotely sensed data as standalone and complementary remote sensing data sources to optical data. The course builds on GEOG228 by focusing on the unique aspects of the microwave region of the electromagnetic spectrum. Microwaves have wavelengths around 1 cm to 1 m, approximately 100,000 times longer than optical wavelengths, so that interactions with the earth's surface, and approaches for landscape information extraction, require unique treatments. Earth observation utilizes plethora of microwave satellite sensors for monitoring physical phenomena and hazards. Several sensors will be discussed in class and for the lab assignments, examining different applications and case studies. We will also explore LiDAR data for the evaluation of natural environments. The lectures will introduce to the potential of these data and a specific processing and analysis philosophy, while the lab assignments will let you process and analyse LiDAR data. There will be four laboratory assignments that will explore innovative approaches for using optical, microwave and LiDAR remotely sensed data. Emphasis will be placed on innovative applications made possible by recent advances in these technologies, though several analytical approaches learned in this course are transferable to other remote sensing domains such as optical.

KEY THEMES: microwave remote sensing, RADAR, altimetry, LiDAR, object-based image analysis

REQUIRED TEXT(S)

None. For laboratory assignments you will be expected to make additional use of remote sensing texts, journal articles, other material in the university libraries, & web-based information to support your work.

RECOMMENDED TEXT(S)

1. Mather, P.M. (2011). Computer processing of remotely sensed images. 4th ed. Wiley-Blackwell, Hoboken, NJ.

An introductory text that provides both the basics of remote sensing of more advanced material on sensors and processing techniques. FREELY AVAILABLE:

<http://ezproxy.library.uvic.ca/login?url=http://onlinelibrary.wiley.com/book/10.1002/9780470666517>

2. Richards, J.A., (2009). Remote Sensing with Imaging Radar. Springer, Heidelberg, Germany.

A resource book which does an excellent job of providing a rigorous treatment of microwave imaging but in a manner suited to earth scientists rather than practitioners of theoretical electromagnetism. Focus is on radar but the book includes a chapter on passive microwave remote sensing.

3. Woodhouse, I.H. (2006). Introduction to Microwave Remote Sensing. Taylor and Francis, Boca Raton, Florida.

A very readable primer in active and passive microwave remote sensing. Contains overviews of several applications.

INSTRUCTOR INFORMATION

Aikaterini Tavri, Department of Geography, **DTB A247 (ICE Lab)**, atavri@uvic.ca.

When emailing me please include 'GEOG 322 - your name - brief subject' in the subject line. This helps me sort through emails and makes it easier to respond to your message.

Office Hours: *Wednesdays from 1pm to 2pm (zoom link will be provided)*

Profile: I am a PhD Candidate in the Ice Climate Ecosystem (ICE) remote sensing laboratory at the Department of Geography. My research focuses on the Arctic sea ice in the Canadian Archipelago, studying the melt season using Synthetic Aperture Radars (SAR). I have a BSc in oceanography and marine sciences and an MSc in satellite application engineering. I am passionate about teaching remote sensing topics for earth observation. To learn more about me and/or our Lab activities, and stay updated with exciting new studies in our field, please visit <https://icelab.ca/research/>

LEARNING OUTCOMES

Theoretical: foundations of passive and active microwave remote sensing and LiDAR, information extraction, and policy issues. Technical: state-of-the-art software, image processing, modelling, and information extraction procedures. Practical: remote sensing and geospatial data analysis skills, remote sensing as a science and resource management tool, critical assessment of research literature, scientific and technical writing, knowledge communication.

EVALUATION

[1] Midterm Exam	20%
[2] Final Exam	30%
[3] Lab 1	10%
[4] Lab 2	10%
[5] Lab 3	15%
[6] Lab 4	15%

GEOGRAPHY DEPARTMENT INFORMATION

Geography Department website: <http://geog.uvic.ca>

Undergraduate Advising: geogadvisor@uvic.ca

GRADING SYSTEM

As per the Academic Calendar:

Grade	Grade point value	Grade scale	Description
A+ A A-	9 8 7	90-100% 85-89% 80-84%	Exceptional, outstanding and excellent performance. Normally achieved by a minority of students. These grades indicate a student who is self-initiating, exceeds expectation and has an insightful grasp of the subject matter.
B+ B B-	6 5 4	77-79% 73-76% 70-72%	Very good, good and solid performance. Normally achieved by the largest number of students. These grades indicate a good grasp of the subject matter or excellent grasp in one area balanced with satisfactory grasp in the other area.
C+ C	3 2	65-69% 60-64%	Satisfactory, or minimally satisfactory. These grades indicate a satisfactory performance and knowledge of the subject matter.
D	1	50-59%	Marginal Performance. A student receiving this grade demonstrated a superficial grasp of the subject matter.
F	0	0-49%	Unsatisfactory performance. Wrote final examination and completed course requirements; no supplemental.
N	0	0-49%	Did not write examination or complete course requirements by the end of term or session; no supplemental.

BRIGHTSPACES

BrightSpaces learning management systems (LMS) will serve as the main avenue of communication (<https://bright.uvic.ca>). Please monitor the page on a regular basis for course announcements. If you are having difficulty logging in or password problems, contact the Computer Help Desk Email: helpdesk@uvic.ca, Tel: 250-721-7687

LABS

There are 4 lab assignments. The labs are an essential part of the course, and you are expected to have basic computer skills such as file maintenance, word processing, and conducting spreadsheet operations (e.g. Microsoft Excel). **Attendance is required.** Each lab will explore unique aspects of microwave remote sensing from systems and applications perspectives. Analysis and presentation of data, as well as preparation of synthesis reports, are valuable skills that will be developed as part of lab assignments. Time

outside of regularly scheduled labs will be required to complete assignments, so plan accordingly. **All assignments must be submitted in PDF form, following academic standards.**

There will be a 20% penalty for late lab submissions and in the case of not submitting your assignments in 5 days, they will be automatically graded with 0.

WEEKLY CALENDAR

WEEK	DATE	
1	TW 10/11 Jan	Course Introduction – Radiation Framework (1)
2	TW 17/18 Jan	Radiation Framework (2) - Passive Microwave (1) – Lab intro
3	TW 24/25 Jan	Passive Microwave (2) - Passive Microwave (3) – Lab 1
4	TW 01 Feb	Passive Microwave (3) - Passive Microwave (4) – Lab 1
5	TW 07/08 Feb	Active Microwave (1) - Active Microwave (2) – Lab 2
6	TW 14/15 Feb	Guest Lecture on Glaciers and SAR - Active Microwave (3) – Lab 2
7	TW 21/22 Feb	READING BREAK, NO CLASS
8	TW 01 Mar	Mid-term preparation- Active Microwave (3) - Mid-term exam – Lab 3
9	TW 07/08 Mar	Altimeters (1)- Altimeters (2) – Lab 3
10	TW 14/15 Mar	LiDAR (1) – LiDAR (2) – Lab 4
11	TW 21/22 Mar	Guest Lecture on LiDAR and drones– LiDAR (3) – Lab 4
12	TW 28/29 Mar	Object based image analysis (1) and (2) – Lab 4
13	TW 04/05 Apr	Course review – final remarks

DISCLAIMER

The presented schedules, policies, procedures, and assignments in this course are subject to change in the event of extenuating circumstance.

PLAGIARISM

Academic dishonesty (plagiarism, cheating) is a very serious matter in any academic institution and is dealt with severely at the University of Victoria. *The responsibility of the institution:* Instructors and academic units have the responsibility to ensure that standards of academic honesty are met. By doing so, the institution recognizes students for their hard work and assures them that other students do not have an unfair advantage through cheating on essays, exams, and projects. *The responsibility of the student:* Plagiarism sometimes occurs due to a misunderstanding regarding the rules of academic integrity, but it is the responsibility of the student to know them. If you are unsure about the standards for citations, for referencing your sources, or unauthorized use of an editor, please familiarize yourself with the University policy on academic integrity found in the Undergraduate Calendar at the following website <http://web.uvic.ca/calendar/undergrad/info/regulations/academic-integrity.html>.

Please contact me if you have any questions.

Infractions will be dealt with in accordance with university policy. Commonly, the penalty for any form of cheating/plagiarism is a grade of F on the tests or laboratory assignments, or a final grade of F in the course. However, depending on the severity of the case other penalties may include a record on the student's transcript or expulsion.

ACCESSIBILITY

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a documented disability/health consideration that may require accommodations, please feel free to approach me and/or the Centre for Accessible Learning (CAL) as soon as possible. The CAL staff are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations <http://www.uvic.ca/services/cal/>. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.

POSITIVITY AND SAFETY

The University of Victoria is committed to promoting, providing and protecting a positive and safe learning and working environment for all its members. To ensure that all class members feel welcomed and equally able to contribute to class discussions, we will all endeavor to be respectful in our language, our examples, and the manner in which we conduct our discussions and group work. If you have any concerns about the climate of the class, please contact me.

SEXUALIZED VIOLENCE PREVENTION AND RESPONSE AT UVIC

UVic takes sexualized violence seriously, and has raised the bar for what is considered acceptable behavior. We encourage students to learn more about how the university defines sexualized violence and its overall approach by visiting www.uvic.ca/svp. If you or someone you know has been impacted by sexualized violence and needs information, advice, and/or support please contact the sexualized violence resource office in Equity and Human Rights (EQHR). Whether or not you have been directly impacted, if you want to take part in the important prevention work taking place on campus, you can also reach out:

Where: Sexualized violence resource office in EQHR, Sedgewick C119

Phone: 250.721.8021

Email: svpcoordinator@uvic.ca

Web: www.uvic.ca/svp

COURSE EXPERIENCE SURVEY (CES)

We value your feedback on this course. Towards the end of the course, as in all other courses at UVic, you will have the opportunity to complete an anonymous survey regarding your learning experience (CES). The survey is vital to providing feedback to me regarding the course and my teaching, as well as to help the department improve the overall program for students in the future. The survey is accessed via MyPage and can be done on your laptop, tablet, or mobile device. I will remind you and provide you with more detailed information nearer the time but please be thinking about this important activity during the course.

NOTE:

A note to remind you to take care of yourself. Do your best to maintain a healthy lifestyle this semester by eating well, exercising, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress. All of us benefit from support during times of struggle. You are not alone.

Counselling Services - Counselling Services can help you make the most of your university experience. They offer free professional, confidential, inclusive support to currently registered UVic students.
uvic.ca/services/counselling/

Health Services - University Health Services (UHS) provides a full service primary health clinic for students, and coordinates healthy student and campus initiatives. uvic.ca/services/health/
Centre for Accessible Learning - The CAL staff are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations uvic.ca/services/cal/. *The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.*

Elders' Voices - The Office of Indigenous Academic and Community Engagement (IACE) has the privilege of assembling a group of Elders from local communities to guide students, staff, faculty and administration in Indigenous ways of knowing and being.
uvic.ca/services/indigenous/students/programming/elders/index.php