



We acknowledge and respect the Lək̓ʷəŋən (Songhees and X̱wsep̓səm/Esquimalt) Peoples on whose territory the university stands, and the Lək̓ʷəŋən and W̱SÁNEĆ Peoples whose historical relationships with the land continue to this day.

<https://youtu.be/UVNGEDpqThg>

---

### **COURSE OUTLINE**

**Remote Sensing of the Environment using Active Sensors**

**Lecture: Clearihue Building C112 10:30 AM-11:20 AM Tuesdays and Wednesdays**

**Labs: DTB A249 - B01 Tuesdays (2:30 PM-4:20 PM); B02 Wednesday (12:30PM-2:20PM);  
or B03 Thursdays (8:30 AM-10:20 AM)**

---

**Office Hours: Tuesdays 12:30pm-2:30pm or by appointment**

**Office Location: DTB B122**

**Contact: [randy@uvic.ca](mailto:randy@uvic.ca)**

### **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 primarily on active instruments, and especially on the unique aspects of the microwave region of the electromagnetic spectrum (in both passive and active domains). 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.

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 assignment will let you process and analyze LiDAR data. There will be four laboratory assignments that will explore innovative approaches for using 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. 4<sup>th</sup> 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.

## LEARNING OUTCOMES

Theoretical: foundations of microwave remote sensing, altimetry, 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

Midterm Exam	20%
Final Exam	30%
Lab 1	10%
Lab 2	15%
Lab 3	10%
Lab 4	15%

## GRADING SYSTEM

As per the Academic Calendar:

Grade	Grade point value	Grade scale	Description
A+	9	90-100%	<b>Exceptional, outstanding and excellent</b> 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.
A	8	85-89%	
A-	7	80-84%	
B+	6	77-79%	<b>Very good, good and solid</b> 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.
B	5	73-76%	
B-	4	70-72%	
C+	3	65-69%	<b>Satisfactory, or minimally satisfactory.</b> These grades indicate a satisfactory performance and knowledge of the subject matter.
C	2	60-64%	

<b>D</b>	1	50-59%	<b>Marginal</b> Performance. A student receiving this grade demonstrated a superficial grasp of the subject matter.
<b>F</b>	0	0-49%	<b>Unsatisfactory</b> performance. Wrote final examination and completed course requirements; no supplemental.
<b>N</b>	0	0-49%	Did not write examination or complete course requirements by the end of term or session; no supplemental.

## **GEOGRAPHY DEPARTMENT INFO**

- Geography Department website: [uvic.ca/socialsciences/geography/](http://uvic.ca/socialsciences/geography/)
- Geography Department Chair: [geogchair@uvic.ca](mailto:geogchair@uvic.ca)
- Geography Undergraduate Advising: [geogadvising@uvic.ca](mailto:geogadvising@uvic.ca)

## **BRIGHTSPACE**

Brightspace learning management systems (LMS) will serve as the main avenue of communication (<https://www.uvic.ca/systems/services/learningteaching/brightspace/index.php>). 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](mailto:helpdesk@uvic.ca), Tel: 250-721-7687.

---

## **POLICY ON LATE ASSIGNMENTS**

Late lab assignments are subject to significant penalties: 20% per day following the due date and time. Exceptions will only be granted for medical or compassionate reasons. Please contact the instructor within five working days if possible. Only the course instructor can grant exceptions. Conflicts with work, holidays or travel plans are not considered an acceptable reason to apply for a deferred assignment or project extension.

Unless otherwise stated students are expected to complete assignments independently.

## **POLICY ON ATTENDANCE**

Attendance is expected for lectures and lab assignment time. Recordings of lecture material or laboratory introductions will not be provided unless the University reinstates online learning. High level of student cooperation and participation, involving asking and answering questions is expected. Students are also expected to be punctual for course meetings. Cell phones must be turned off or silenced during lectures and labs and ONLY be used during field activities if pertinent to do so.

As an Instructor, I can refuse a student admission to a lecture, laboratory, learning activity or exam because of lateness, misconduct, inattention, or failure to meet the responsibilities of the course. Students who neglect their academic work may be assigned a final grade of 'N' (which equals a Grade Point Value of 0) or debarred from final examinations. Please refer to the UVic academic calendar in the section on student academic conduct for further information.

## **ACADEMIC INTEGRITY**

It is every student's responsibility to be aware of the university's policies on academic integrity,

including policies on cheating, plagiarism, unauthorized use of an editor, multiple submission, and aiding others to cheat.

Policy on Academic Integrity: [web.uvic.ca/calendar/undergrad/info/regulations/academic-integrity.html](http://web.uvic.ca/calendar/undergrad/info/regulations/academic-integrity.html)

If you have any questions or doubts, talk to me, your course instructor. For more information, see [uvic.ca/learningandteaching/cac/index.php](http://uvic.ca/learningandteaching/cac/index.php).

## **USE OF AI**

Please be advised that in this course you are not authorized to use any form of generative AI unless as instructed in the lab sessions. Students should otherwise not make any use of generative AI tools such as ChatGPT, Grammarly, among others that use AI for content generation and editing. As the University of Victoria states on its Academic Integrity Policy “Academic integrity requires commitment to the values of honesty, trust, fairness, respect, and responsibility.”

## **ACCESSIBILITY**

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a documented disability or health consideration that may require accommodations, please feel free to approach me and/or the Centre for Accessible Learning (CAL) as soon as possible ([uvic.ca/services/cal/](http://uvic.ca/services/cal/)). The CAL staff is available by appointment to assess specific needs, provide referrals, and arrange appropriate accommodations. 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.

## **SEXUALIZED VIOLENCE PREVENTION AND RESPONSE AT UVIC**

UVic takes sexualized violence seriously, and has raised the bar for what is considered acceptable behaviour. We encourage students to learn more about how the university defines sexualized violence and its overall approach by visiting [uvic.ca/svp](http://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](mailto:svpcoordinator@uvic.ca)  
Web: [uvic.ca/svp](http://uvic.ca/svp)

Where: Sexualized violence resource office in EQHR; Sedgewick C119  
Phone: 250.721.8021  
Email: [svpcoordinator@uvic.ca](mailto:svpcoordinator@uvic.ca)  
Web: [uvic.ca/svp](http://uvic.ca/svp)

## **EQUITY AND HUMAN RIGHTS (EQHR)**

EQHR is a resource for students, staff and faculty who have experienced discrimination and harassment and are looking for informal and formal resolution options as well as advice, coaching and/or education. We are available for confidential consultations so that you can ask questions and learn your options.

eqhr01@uvic.ca

Sedgewick C Wing

[www.uvic.ca/equity](http://www.uvic.ca/equity)

## RESOURCES FOR INTERNATIONAL STUDENTS

The University of Victoria offers a number of resources to support international students as they pursue their studies. UVic's [International Centre for Students](#) is the primary office supporting international students on campus at the university-wide level and provides various supportive program through the [UVic Global Community Initiative](#), including a Mentorship Program and Conversation Partner Program. For academic advising-related questions, students in the Geography Department are also encouraged to meet with the Geography Undergraduate Advisor ([geogadvising@uvic.ca](mailto:geogadvising@uvic.ca)) as well as an academic advisor in the [Academic Advising Centre](#) early in their studies to help map out a plan to declare a major and complete university program requirements. Other resources include the [Centre for Academic Communication](#) and the [Math and Stats Assistance Centre](#). International students are also encouraged to contact the International Student Liaison in Geography (Prof. CindyAnn Rose-Redwood, [cindyann@uvic.ca](mailto:cindyann@uvic.ca)), who can assist in making connections with other international and domestic students in the Geography Department and share opportunities for getting involved in departmental activities more broadly.

## COURSE EXPERIENCE SURVEY (CES)

I value your feedback on this course. Towards the end of term, 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 online 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.

## WEEKLY CALENDAR

WEEK	LECTURE DATES	Lecture Information [ <i>Lab Information</i> ]
1	T 06 Jan, W 07 Jan	Intro / Radiation Primer, Radiation Primer [ <i>No labs</i> ]
2	T 13 Jan, W 14 Jan	Radiation Primer, Passive Microwave [ <i>Lab 1</i> ]
3	T 20 Jan, W 21 Jan	Passive Microwave, Passive Microwave [ <i>Lab 1</i> ]
4	T 27 Jan, W 28 Jan	Active Microwave, Active Microwave [ <i>Lab 2</i> ]
5	T 03 Feb, W 04 Feb	Active Microwave, SAR [ <i>Lab 2</i> ]
6	T 10 Feb, W 11 Feb	SAR, MID-TERM EXAM [ <i>Lab 2</i> ]
7	T 17 Feb, W 18 Feb	READING BREAK – NO LECTURES
8	T 24 Feb, W 25 Feb	Altimetry, Altimetry [ <i>Lab 3</i> ]
9	T 03 Mar, W 04 Mar	Altimetry, Altimetry [ <i>Lab 3</i> ]
10	T 10 Mar, W 11 Mar	LiDAR, LiDAR [ <i>Lab 4</i> ]

11	T 17 Mar, W 18 Mar	LiDAR, LiDAR [ <i>Lab 4</i> ]
12	T 24 Mar, W 25 Mar	Object-based Analysis, Object-based Analysis [ <i>Lab 4</i> ]
13	T 31 Mar, W 01 Apr	Guest Lecture, Course Review and Future Directions

## DISCLAIMER

The above schedule, policies, procedures, and assignments in this course are subject to change in the event of extenuating circumstances.

## 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/](http://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/](http://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/](http://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](http://uvic.ca/services/indigenous/students/programming/elders/index.php)

---