



COURSE OUTLINE

Remote Sensing of the Environment using Active Sensors

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

Labs: DTB A251 Tuesdays (2:30 PM-4:20 PM) or Thursdays (8:30 AM-10:20 AM)

Office Hours: Tuesdays 1:00pm-2:30pm or by appointment

Office Location: DTB B122

Contact: 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. 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.

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	10%
Lab 3	15%
Lab 4	15%

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.

GEOGRAPHY DEPARTMENT INFO

- Geography Department website: uvic.ca/socialsciences/geography/
- Geography Department Chair: geogchair@uvic.ca
- Geography Undergraduate Advising: geogadvising@uvic.ca

BRIGHTSPACE

Lectures materials, assigned readings, and general course communications will be via Brightspace. You are required to come prepared for each lecture. This means you should have read and considered the assigned readings.

LABS

Lab Instructor Terri Evans: tevans@uvic.ca

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. All labs will be held in the Geomatics Lab A251. 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.

Lab Website

<http://labs.geog.uvic.ca/geog322/>

user: geog322

pw: fusion

POLICY ON LATE ASSIGNMENTS

Late lab assignments are subject to significant penalties: 20% per day following the due date and time. Exceptions are not permitted except for circumstances involving medical or compassionate reasons. Written verification as proof may be requested at the discretion of the instructor.

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

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

The instructor reserves the right to use plagiarism detection software programs to detect plagiarism in written assignments.

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/). 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. 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: uvic.ca/svp

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) 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), 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 09 Jan, W 10 Jan	Course Intro / Radiation Primer, Radiation Primer
2	T 16 Jan, W 17 Jan	Passive Microwave, Passive Microwave [<i>Lab 1</i>]
3	T 23 Jan, W 24 Jan	Passive Microwave, Passive Microwave [<i>Lab 1</i>]
4	T 27 Feb, W 31 Feb	Active Microwave, Active Microwave [<i>Lab 2</i>]
5	T 06 Feb, W 07 Feb	Active Microwave, Active Microwave [<i>Lab 2</i>]
6	T 13 Feb, W 14 Feb	Active Microwave, MID-TERM EXAM [<i>Lab 3</i>]
7	T 20 Feb, W 21 Feb	READING BREAK – NO LECTURES
8	T 27 Feb, W 28 Feb	Active Microwave, Altimetry [<i>Lab 3</i>]
9	T 05 Mar, W 06 Mar	Altimetry, Altimetry [<i>Lab 3</i>]
10	T 12 Mar, W 13 Mar	LiDAR, LiDAR [<i>Lab 4</i>]
11	T 19 Mar, W 20 Mar	LiDAR, LiDAR [<i>Lab 4</i>]
12	T 26 Mar, W 27 Mar	Guest Lecture, Object-based Analysis [<i>Lab 4</i>]
13	T 02 Apr, W 03 Apr	Object-based Analysis, 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/

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
