



**Faculty of Social Sciences
Department of Geography**

**University
of Victoria**

**Geography 391 A01
TOPICS IN GEOGRAPHY: MICROWAVE REMOTE SENSING
Fall 2015**

Instructor: Dr. Randy Scharien
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Lab Instructor: Terri Evans (tevens@uvic.ca)

Course Description

The aim of this course is to develop your theoretical and practical understanding of microwave remote sensing through readings, group discussions, presentations, and laboratory assignments. The course builds on GEOG319 or GEOG322 by focusing on the unique aspects of the microwave region of the electromagnetic spectrum. Microwaves have wavelengths on the order of 10 cm, 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. Both passive and active modes of microwave remote sensing are covered during the course. Emphasis is placed on innovative applications made possible by recent advances in radar technology.

Class Meetings

Monday/Thursday 08:30-09:50 COR B111

Text and Readings

There is no required text for this course and assigned readings will be posted on CourseSpaces. The following are recommended as reference material.

1. 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.

2. 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 application domains.

3. Ulaby, F.T, R.K. Moore, and A.K. Fung (1986). Microwave Remote Sensing: Active and Passive, Volume 3 Volume Scattering and Emission Theory, Advanced Systems and Applications. Addison-Wesley, Reading, Mass.

Third part of a three volume set considered by many to be the benchmark books that provided the first comprehensive treatment of microwave remote sensing. Part three is suggested due to its focus on many different application domains.

For laboratory assignments you will be expected to make additional use of remote sensing journal articles, other material in the university libraries, and web-based information in support of your work.

Course Components

CLASS MEETINGS

Each class meeting will typically comprise an overview lecture on a topic given by the instructor, followed by an interactive and student led discussion of the material. The overview lectures will build from the assigned readings posted on CourseSpaces. You are required to come prepared for each lecture. This means you should have read and considered the assigned readings.

LABS

There are 4 lab assignments (see course schedule below). 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 A251/253. Each lab will explore unique aspects of microwave remote sensing from systems and applications perspectives. The labs will provide you with practice using remote sensing software for the analysis of microwave remote sensing data, including the Sentinel-1 Toolbox (<https://sentinel.esa.int/web/sentinel/toolboxes/sentinel-1>). I strongly encourage you to spend time at the beginning of the course accessing the software and working through the tutorials provided with it, in order to gain proficiency with this package.

Analysis and presentation of data, as well as preparation of synthesis reports, are valuable skills that will be developed as part of lab assignments.

Specific announcements regarding lab due dates and times will be made by the lab instructor Terri Evans.

EXAMS

There is a mid-term exam and a final exam in this course. Each exam will cover lecture material independently from the other. Further details will be provided during class.

Grading Scheme

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

Course Schedule

Week	Date	Topic	Lab (Monday)
1	Sep 10	Course intro and structure	No lab
2	Sep 14	Radiation – a primer	Lab 1
	Sep 17	Comparing passive and active microwave remote sensing	
3	Sep 21	Passive I	Lab 1
	Sep 24	Passive II	
4	Sep 28	Passive III	Lab 2 (Lab 1 due)
	Oct 01	Passive IV	
5	Oct 05	Applications I: Passive microwave and study of climate	Lab 2
	Oct 08	SAR I	
6	Oct 12	<i>No class – Thanksgiving Day</i>	No lab
	Oct 15	SAR II	
7	Oct 19	SAR III	Lab 3 (Lab 2 due)
	Oct 22	<i>MIDTERM EXAM</i>	
8	Oct 26	Applications II: Canadian sovereignty	Lab 3
	Oct 29	SAR IV	
9	Nov 02	Applications III: SAR constellations	Lab 3
	Nov 05	PolSAR I	
10	Nov 09	<i>No class – Reading Break</i>	No lab
	Nov 12	PolSAR II	
11	Nov 16	Applications IV: SAR and forestry in British Columbia	Lab 4 (Lab 3 due)
	Nov 19	Interferometry I	
12	Nov 23	Interferometry II	Lab 4
	Nov 26	Altimetry I	
13	Nov 30	Altimetry II	Lab 4
	Dec 03	Exam structure and review topics of your choice	

Late Assignment Policy

Late lab assignments are subject to significant penalties: 10% for each 24 hour period 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.

Course Experience Survey (CES)

I value your feedback on this course. Towards the end of term you will have the opportunity to complete a confidential course experience survey (CES) regarding your learning experience. 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. When it is time for you to complete the survey, you will receive an email inviting you to do so. If you do not receive an email invitation, you can go directly to <http://ces.uvic.ca>. You will need to use your UVic NetLink ID to access the survey, which can be done on your laptop, tablet or mobile device. I will remind you nearer the time, but please be thinking about this important activity, especially the following three questions, during the course.

1. What strengths did your **instructor** demonstrate that helped you learn in this course?
2. Please provide specific suggestions as to how the **instructor** could have helped you learn more effectively.
3. Please provide specific suggestions as to how this **course** could be improved.

Grade Scale

A+	A	A-	B+	B	B-	C+	C	D	F
90-100%	85-89%	80-84%	77-79%	73-76%	70-72%	65-69%	60-64%	50-59%	0-49%

Academic Integrity

Academic integrity requires commitment to the values of honesty, trust, fairness, respect and responsibility. It is expected that students, faculty members and staff at the University of Victoria, as members of an intellectual community, will adhere to these ethical values in all activities related to learning, teaching, research and service. Any action that contravenes this standard, including misrepresentation, falsification or deception, undermines the intention and worth of scholarly work and violates the fundamental academic rights of members of our community. Students are advised to consult the university's Policy on Academic Integrity in the University Calendar. The instructor reserves the right to use plagiarism detection software programs to detect plagiarism in term papers.

The University of Victoria is committed to promoting, providing and protecting a positive and safe learning and working environment for all its members.