University of Victoria

GEOGRAPHY 322 - A01
UNIVERSITY OF VICTORIA
Spring TERM 2018
Randy Scharien

COURSE OUTLINE
Digital Remote Sensing

Office Hours: Thursdays 11:00-12:00
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 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.

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

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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, and web-based information in support of 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 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

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: http://geog.uvic.ca
- Undergraduate Advisor: Dr. Phil Wakefield – geogadvisor@uvic.ca

COURSESPACES

Lectures materials, assigned readings, and general course communications will be via 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. 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. Analysis and presentation of data, as well as preparation of synthesis reports, are valuable skills that will be developed as part of lab assignments.

Lab Website
http://labs.geog.uvic.ca/geog322/
user: geog322
pw: fusion

Students need a high speed USB3 memory stick - 32GB for 3rd and 4th year remote sensing. Rick Sykes, computing support in Geography, has a limited number for purchase ($20 cash only, no change given). Geomatics students will be allowed one from Rick at this price over the course of their undergrad. They are welcome to pick up one elsewhere, but do note that a regular USB2 is not adequate – it must be a high speed USB3 memory stick.

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

POLICY ON LATE ASSIGNMENTS

Late lab assignments are subject to significant penalties: 20% 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.

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**:
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 http://www.uvic.ca/learningandteaching/students/resources/expectations/. 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 https://www.uvic.ca/services/cal/). The RCSD 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.

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 via MyPage and can be done on your laptop, tablet, or mobile device. I will remind you and provide you with more information nearer the time but please be thinking about this important activity during the course.

WEEKLY CALENDAR

WEEK	DATE	
1	T 4 Jan	Course introduction and structure
2	M 8 Jan, R 11 Jan	Radiation Primer, Radiation Primer
3	M 15 Jan, R 18 Jan	Passive microwave, Passive Microwave
4	M 22 Jan, R 25 Jan	Passive Microwave, RADAR Introduction
5	M 29 Jan, R 1 Feb	RADAR Scatterometer, RADAR Scatterometer
6	M 5 Feb, R 8 Feb	Synthetic Aperture RADAR, Synthetic Aperture RADAR
7	M 12 Feb, R 15 Feb	READING BREAK, NO LECTURES
8	M 19 Feb, R 22 Feb	Synthetic Aperture RADAR, MID TERM EXAM
9	M 26 Feb, R 1 Mar	Guest Lecture #1, LiDAR
10	M 5 Mar, R 8 Mar	LiDAR, LiDAR
11	M 12 Mar, R 15 Mar	Object-based Analysis, Object-based Analysis
12	M 19 Mar, R 22 Mar	Guest Lecture #2, Altimetry
13	M 26 Mar, R 29 Mar	Altimetry, Altimetry
14	2 Apr, 5 Apr	EASTER MONDAY (NO CLASS), Course Review

DISCLAIMER

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