GEOGRAPHY 322 A02
UNIVERSITY OF VICTORIA
Spring Term 2021
Aikaterini Tavri

COURSE OUTLINE
Digital Remote Sensing

Contact: atavri@uvic.ca or during office hours every Thursday from 1 to 2pm
Class Meetings: Tuesdays and Wednesdays 10:30-11:20

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 λyűŜNJI·ŏűλ2yã øλúK úKŜ ŜI·NúKΩă ădzNŦI·ŏŜΣ I·yŘ I·LJLJN2I·ŏKŜă Ŧ2N fI·yŘăÔI·LJŜ λyŦ2NY I·úλ2y˝ŜÈúNI·ŏűλ2yΣ NŜIjdzλNŜ 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.

The lectures will be a combination of synchronous and asynchronous. Each lecture will be pre-recorded and presented during the lecture times every week, with real time commenting and examples. Thus, attendance is important, but not mandatory.

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.

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Office Hours: *Thursdays*

Profile: I am a PhD Candidate in the Ice Climate Ecosystem remote sensing laboratory at the Department of Geography. My research is focused on enhancing sea ice melt stage detection and ice type discrimination during melting conditions in the Canadian Arctic Archipelago. Using synthetic aperture radar (SAR) data from three satellite missions, advanced polarimetric parameters will provide proxy information about sea ice mechanical properties and hazards, with implications for marine transportation during the active summer season, as well as ecosystems information related to the seasonal progression of bioavailable light to the upper ocean. I have a BSc in oceanography and marine sciences and an MSc in satellite application engineering. I am passionate about teaching remote sensing focused 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 (tentative)

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

Additional information about the evaluation components can be found on brightspaces.

GEOGRAPHY DEPARTMENT INFORMATION

Geography Department website: http://geog.uvic.ca
Undergraduate Advising: geogadvisor@uvic.ca

GRADING SYSTEM

As per the Academic Calendar:

Grade

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

ZOOM meetings policy

DISCLAIMER

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