

# REMOTE SENSING PROJECT WINTER 2023

## GEOG 471

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### CLASS SCHEDULE

Section	Location	Time	Instructor(s)
GEOG 471 001 [SEM]	EV3 3412	Wednesdays 2:30 p.m. - 5:20 p.m.	Vicky Vanthof vrvanthof@uwaterloo.ca
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### INSTRUCTOR / TA INFORMATION

Victoria Vanthof  
vrvantho@uwaterloo.ca  
Office Hours: Wednesday 12-2 pm, Magellan Lab (EV2-1014)

Wei Wang  
w444wang@uwaterloo.ca  
Office Hours: Mon. 12-1 pm, Magellan Lab (EV2-1014)

Mike Lackner (MAD) Mapping Analysis and Design  
mlackner@uwaterloo.ca  
Office Hours: by appointment

### COURSE DESCRIPTION

#### *Calendar Description for GEOG 471*

Digital image analysis for resource mapping and evaluation using remote sensing data. Topics range from initial data selection to final map production and assessment. Using commercial image analysis software, students will analyse data for a selected area and produce a portfolio of results. In addition, they will undertake a literature review on a selected topic and present highlights of the review at an end-of-term mini-conference.

Prereq: GEOG 371; Level at least 3A

This course has a very strong application focus in the form of remote sensing observations for climate and land cover change studies. The aim of this course is to develop students' theoretical and practical understanding of remote sensing through project-based work using a variety of image analysis software to address a substantive aspect of climate change. It builds on courses GEOG271, GEOG371 and GEOG293/294. Working in a group and individually, students identify and develop a research study that uses remote sensing data sets to address a substantive issue related to environmental change.

## LEARNING OUTCOMES

### By the end of this course students should be able to:

Design, plan, and execute a science-based resource management project focusing on the application of remote sensing and digital information extraction. The project will be expected to be responsive to one of the 17 United Nation's Sustainable Development Goals (SDGs).

Conduct a literature synthesis of your topic from the remote sensing research literature, perform a series of image processing tasks related to that topic, and place your work in context of what others have done

Communicate the results of your efforts to the instructor through a project report paper and to your peers through a class group presentation

Be competent in a range of geographical skills, particularly those relating to problem identification, research methodology definition, remote sensing data analysis and interpretation, and research communication

Be aware of some of the inter-linkages within and between the remote sensing information content and knowledge in human and/or physical and human geography

Develop further your range of personal transferable skills, including the ability to present material orally and in report form and to work effectively both as an individual and as a member of a group

Be aware more keenly of your own range of personal transferable skills and be able to assess, critically and constructively, the contribution of team members, including yourself, to the group in which you work

## TENTATIVE COURSE SCHEDULE

Lecture Date	Topic
Jan 11	<p><b>Lecture: Introductions - course overview. Project selections, establishment and design. Course expectations (GEOG271and GEOG371 foundations).</b></p> <p>Tutorial Discussion: group selection, project definition.</p> <p>Tutorial Lab Task 1: Procedures in RS – Exploring data platforms (part 1) and set up of GEE and Planet Labs account</p>
Jan 18	<p><b>Lecture: Exploring instruments and data sets available for project work. Data formats.</b></p> <p>Tutorial Discussion: Project analysis approach and data needs - assign member roles</p> <p>Tutorial Lab Task 2: Procedures in RS – Exploring data platforms (part 2)</p>

Jan 25	<p><b>Lecture: Multiple data set analysis – An Introduction to Planet Imagery</b></p> <p>Tutorial Discussion: Proposal writing and finalizing data needs</p> <p>Tutorial Lab Task 3: Procedures in RS – Lidar/lastools or Planet Lab tutorial</p>
Feb 1	<p><b>Lecture: Google Earth Engine and Group presentations on proposed projects ( 5 min. each)</b></p> <p>Tutorial Discussion: Group editing of proposal</p> <p>Tutorial Lab Task 4: Procedures in RS – Using Google Earth Engine for change analysis</p> <p><b>Proposals Due on 1 February 2023 (Online + Printed)</b></p>
Feb 8	<p><b>Lecture: Google Earth Engine cont. and Change Detection</b></p> <p>Tutorial Discussion: project work</p> <p>Tutorial Lab Task 5: Procedures in RS – Radar Processing in SNAP</p>
Feb 15	<p><b>Lecture: Verification and testing</b></p> <p>Tutorial Discussion: estimating errors and uncertainty from RS analyses</p> <p>Tutorial Lab Task 6: Procedures in RS – Landsat accuracy assessment</p> <p><b>Literature Review Due on 17 February 2023 (Online)</b></p>
Feb 22	<p><b>UW READING WEEK</b></p>
Mar 1	<p><b>Lecture: Project reporting – expectations and timelines, mandatory update from each group on progress, problems and plans, submit group check-in form</b></p> <p>Tutorial Discussion: Project work</p>
Mar 8	<p><b>Lecture: Project reporting – expectations and timelines, mandatory update from each group on progress, problems and plans, submit group check-in form</b></p> <p>Tutorial Discussion: Project work</p>
Mar15	<p><b>Lecture: Project reporting – expectations and timelines, mandatory update from each group on progress, problems and plans, submit group check-in form</b></p> <p>Tutorial Discussion: Project work</p>

Mar 22	<b>Lecture: Project reporting – expectations and timelines, mandatory update from each group on progress, problems and plans, submit group check-in form</b>  Tutorial Discussion: Project work
Mar 29	<b>Final Presentations Due on 29 March 2023</b>  Lecture: Final Presentations (EV3 Atrium)
April 5	No Lecture  <b>Final Project Report Due 5 April 2023 (Online)</b>

## TEXTS / MATERIALS

Title / Name	Notes / Comments	Required
Jensen, J.R., 2015. Introductory Digital Image Processing: A Remote Sensing Perspective. Fourth Edition. Prentice Hall, Toronto, Canada.	Available in the Library – 3 hour short loan). Earlier versions are also good, especially 3rd Edition	No
Jensen, J.R. 2007. Remote Sensing of Environment: and Earth Resources Perspective, Second Edition, Prentice Hall, Toronto, Canada.		No
Lillesand, T.M., Kiefer, R.W. and Chipman, J., 2015, Remote Sensing and Image Interpretation (Seventh Edition), John Wiley & Sons, Canada, 720pp.	3 hour request	No
Mather, P.M. and M. Koch 2011 Computer Processing of Remotely-sensed Images, (4th Ed.). John Wiley & Sons Canada, 434pp.		No
Campbell, J.B., 2011 Introduction to Remote Sensing (Fifth Edition), The Guilford Press, 667pp.		No
Richards J.A. 2010, Remote Sensing Digital Image Analysis: An Introduction, 4th Edition. SpringerLink	Online through UW library	No

<b>Title / Name</b>	<b>Notes / Comments</b>	<b>Required</b>
Richards, J.A. (2009) Remote Sensing with Imaging Radar, Springer Link.	Online through UW library	No
Montello D.R. and P.C. Sutton (2013) An Introduction to Scientific Research Methods in Geography and Environmental Studies (2nd Edition), London: Sage Publications, pp314.	Project Development - Highly Recommended	No
Hay, I. and Giles, P. (2010) Communicating in Geography and the Environmental Sciences: Canadian Edition, Oxford: Oxford University Press, 312pp.	Great for knowledge communication	No

## STUDENT ASSESSMENT

<b>Component</b>	<b>Value</b>
Participation Tasks – Labs + Project Updates (individual)	6%
Project Proposal (Group submission)	10%
Project Literature Review (Individual submission)	24%
Project Presentation (Group Presentation)	10%
Project Report (Group Submission)	50%

All course activity will be focused on a major term project. The final mark is broken up into specific activities the requirements for which will be explained in detail at the start of the course and by four "Requirements" documents posted on Learn.

Group and Individual contributions will be assessed for specific parts of the evaluation process. See course website for details. Peer evaluation forms part of the final mark to ensure that there is equity of contribution.

**Assignment sanctions.** It is in your interest to keep to the deadlines for assignment submission. Late work will be sanctioned with 20% deducted from the assignment value for each week or part thereof for which the work is late. Sanctioned work may receive no feedback. Authorized medical notes that have been granted by the instructor **prior to the deadline** are the only valid way of obtaining an extension.

# ASSIGNMENT SCREENING

Text matching software (Turnitin) will be used to screen assignments in this course. This is being done to verify that use of all material and sources in assignments is documented. In the first week of the term, details will be provided about the arrangements for the use of Turnitin and alternatives in this course. See Administrative Policy below for more information and links.

## ADMINISTRATIVE POLICY

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**Mental Health:** The University of Waterloo, the Faculty of Environment and our Departments/Schools consider students' well-being to be extremely important. We recognize that throughout the term students may face health challenges - physical and / or emotional. **Please note that help is available.** Mental health is a serious issue for everyone and can affect your ability to do your best work. Counselling Services <https://uwaterloo.ca/campus-wellness/> (<https://uwaterloo.ca/campus-wellness/>) is an inclusive, non-judgmental, and confidential space for anyone to seek support. They offer confidential counselling for a variety of areas including anxiety, stress management, depression, grief, substance use, sexuality, relationship issues, and much more.

All students are encouraged to download the WatSAFE app which is available free through the google and iOS app stores. The WatSAFE app provides on- and off-campus contacts for students in distress, including international students, and other information related to campus safety and security.

**Religious Observances:** Students need to inform the instructor at the beginning of term if special accommodation needs to be made for religious observances that are not otherwise accounted for in the scheduling of classes and assignments.

**Communications with Instructor and Teaching Assistants:** All communication with students must be through either the student's University of Waterloo email account or via LEARN. If a student emails the instructor or TA from a personal account they will be requested to resend the email using their personal University of Waterloo email account.

**Recording lecture:** Use of recording devices during lectures is only allowed with explicit permission of the instructor of the course. If allowed, video recordings may only include images of the instructor and not fellow classmates. Posting of videos or links to the video to any website, including but not limited to social media sites such as: facebook, twitter, etc., is strictly prohibited.

## UNIVERSITY POLICY

**Academic integrity:** In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check [the Office of Academic Integrity](https://uwaterloo.ca/academic-integrity/) (<https://uwaterloo.ca/academic-integrity/>) for more information.]

**Grievance:** A student who believes that a decision affecting some aspect of their university life has been unfair or unreasonable may have grounds for initiating a grievance. Read [Policy 70, Student Petitions and Grievances, Section 4](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70) (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70>) . When in doubt, please be certain to contact the department's administrative assistant who will provide further assistance.

**Discipline:** A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for their actions. [Check [the Office of Academic Integrity](https://uwaterloo.ca/academic-integrity/) (<https://uwaterloo.ca/academic-integrity/>) for more information.] A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules"

for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to [Policy 71, Student Discipline](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71) (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71>) . For typical penalties, check [Guidelines for the Assessment of Penalties](https://uwaterloo.ca/secretariat/guidelines/guidelines-assessment-penalties) (<https://uwaterloo.ca/secretariat/guidelines/guidelines-assessment-penalties>) .

**Appeals:** A decision made or penalty imposed under [Policy 70, Student Petitions and Grievances](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70) (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70>) (other than a petition) or [Policy 71, Student Discipline](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71) (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71>) may be appealed if there is a ground. A student who believes they have a ground for an appeal should refer to [Policy 72, Student Appeals](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-72) (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-72>) .

**Note for students with disabilities:** [AccessAbility Services](https://uwaterloo.ca/disability-services/) (<https://uwaterloo.ca/disability-services/>) , located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

**Turnitin.com:** Text matching software (Turnitin®) may be used to screen assignments in this course. Turnitin® is used to verify that all materials and sources in assignments are documented. Students' submissions are stored on a U.S. server, therefore students must be given an alternative (e.g., scaffolded assignment or annotated bibliography), if they are concerned about their privacy and/or security. Students will be given due notice, in the first week of the term and/or at the time assignment details are provided, about arrangements and alternatives for the use of Turnitin in this course.

It is the responsibility of the student to notify the instructor if they, in the first week of term or at the time assignment details are provided, wish to submit alternate assignment.