

The University of Winnipeg
Department of Geography

GEOG 3319 (3)-001
Advanced Remote Sensing

Fall Term: 09-05-2023 – 12-04-2023
Lectures: Tues/Thurs 1:00 pm – 2:15 pm (3M56)
Lab: Wednesday 1:30 pm – 3:20 pm (Lockhart 5L25)

Instructors: Dr. Joni Storie

E-mail: j.storie@uwinnipeg.ca

Phone: 204-258-3862 (Joni Storie)

Office: 5L05

Office Hours: Tues/Thurs 11:00 am – 12:00 pm.

**Please note when corresponding with the instructor, use your University of Winnipeg email account system: name@webmail.uwinnipeg.ca. Emails from accounts such as Hotmail or Gmail are frequently treated as spam and thus may not reach the recipient.*

Course Description

GEOG-3319(3) ADVANCED REMOTE SENSING (Le3, La2) This course provides instruction on advanced image processing and classification techniques. These techniques are applied to the study of physical and human environments through a series of laboratory exercises and assignments. Students also gain exposure to RADAR and hyperspectral remote sensing including exposure to handheld imaging devices. GEOG-3319L (lab) must be taken concurrently.

Prerequisites: GEOG-2316(3) or permission of instructor.

Course Objectives

The learning goal of this course is to build upon students' knowledge gained from GEOG-2316 and increase confidence in working with remotely sensed data for applications of interest. In a world where big data is needed to solve big problems, taking your skills from introductory remote sensing and applying them on a regional, national or global scale is an essential skill. The following course objectives have been identified:

- Show comprehension of remote sensing theory (e.g., resolutions, spectra, image interpretation, etc.) and python programming which will be assessed through a midterm exam.
- Expand comprehension of remote sensing concepts and tools through the use of a different imaging software (SNAP).
- Development of programming skills in Jupyter Notebook by completing assignments using remote sensing imagery through an introduction to Python for remote sensing data analysis.
- Development of communication skills through (i) report writing and (ii) presentation of your final lab assignment.

NEXUS

Documents related to this course (e.g., course syllabus, project guidelines, supplemental readings, report grading criteria) will be made available to students through the Nexus system. You need to be registered in the course to have access to these materials. To login for Nexus, go to: <https://nexus.uwinnipeg.ca/>. If you encounter difficulties with Nexus contact the help desk at 204-786-9149 or help.desk@uwinnipeg.ca.

This course is offered online and is asynchronous delivery (pre-recorded lectures). The asynchronous nature will include lectures and exams.

Student Evaluation

		Due Date
Lab 1 Report: Review skills developed in intro RS in new-to-you software SNAP	15%	September 27 (beginning of lab)
Midterm Exam	20%	October 24 (lecture room)
Lab 2 Report: Advanced Classification Algorithms	20%	November 8 (beginning of lab)
Lab 3 Report: ArcGIS/Pro and Model Builder; Introduction to Python	30%	November 28 (beginning of lab)
Presentation - video	15%	Due during final exam (TBD)

The final date to withdraw from the course without academic penalty is 13 November 2023. Please note that withdrawing before the VW date does not necessarily result in a fee refund.

University Dates of Significance:

Date	Significance
Sept 5	LECTURES BEGIN for Undergraduate fall term.
Sept 30	Truth and Reconciliation Day: University closed
Oct 9-13	Reading Week (no classes)
Nov 11	REMEMBRANCE DAY: University closed
Nov 13	FINAL DATE to withdraw without academic penalty from courses which begin in September and end in December of the 2023 Fall Term
Dec 4	LECTURES END for the 2023 Fall Term
Dec 7 - 20	Exam period

Graded Components – all assessments should reflect the language and materials presented in this course.

Assignments are submitted on the drive folder for the course (will be discussed in lab). Lab assignments will allow students to refresh skills learned in introductory remote sensing (e.g., download Sentinel data, do a classification, change detection or mosaic, complete a LULC map), learn new advanced classification algorithms, batch processing and skills in python programming (general and specific to remote sensing analysis). The final lab will have the students complete a larger map project using python coding.

The first lab will allow you to review and practice skills developed in introduction to remote sensing while using different data and different software. The second lab assignment introduces you to advance classification algorithms such as Random Forest. Finally, the third lab assignment is based on map automation through batch

processing and use of coding language such as Python. Lab assignments should be submitted using a report format commonly used in remote sensing which includes Title, Author (student name), Date, Introduction, Methods (Data, Analysis), Results & Conclusions, References, Appendices.

Week	Start Date	Topic
1	Sept 5	Course Introduction and Overview, Class and lab expectation. Review of remote sensing theory, data and analysis, resolutions
2	Sept 12	RADAR
3	Sept 19	Advanced Classification algorithms: Random Forest
4	Sept 26	Advanced Classification algorithms: SVM First lab report due (Sept 27)
5	Oct 3	
	Oct 9-13	Reading Week (University Closed)
6	Oct 17	Intro to Python Functions & Graphics
7	Oct 24	Midterm (Oct 24) Python Conditions and Modules
8	Oct 31	Open source python libraries for geospatial data
9	Nov 7	Batch processing Lab 2 report due (Nov 8)
10	Nov 14	Image processing using GDAL
11	Nov 21	Statistics
12	Nov 28	Lab 3 (final lab report) due (Nov 29) Work on Video Presentations of Projects
	TBD	Final Exam date (post video presentation on Nexus)

Grading

The University does not have a standardized grading scheme. For this course, grade equivalents are as follows:

A+ 90-100 %	C+ 65-69.9 %
A 86-89.9 %	C 56-64.9%
A- 80-85.9%	D 50-55.9 %
B+ 75-79.9 %	F less than 50 %
B 70-74.9 %	

The numeric boundaries separating letter grades may be altered at the request of the Department Review Committee or University Senate.



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Course Rules and Guidelines

1. A permitted or necessary change in mode of delivery may require adjustments to important aspects of course outlines, like class schedule and the number, nature, and weighting of assignments and/or exams.
2. Students can find answers to updates and frequently asked questions related to COVID-19 here: <https://www.uwinnipeg.ca/covid-19/index.html>.
3. When it is necessary to **cancel a class** due to exceptional circumstances, I will make every effort to inform students via **uwinnipeg** email (or NEXUS), as well as the Departmental Assistant and Chair/Dean so that

class cancellation forms can be posted outside classrooms. **Students have the responsibility to regularly check their University of Winnipeg e-mail** addresses to ensure timely receipt of correspondence from the University and/or their course instructors.

4. Please note that **withdrawing** before the VW date does not necessarily result in a fee refund.
5. Students with documented disabilities, temporary or chronic medical conditions, requiring **academic accommodations** for tests/exams or during lectures/laboratories are encouraged to contact Accessibility Services (AS) at 204.786.9771 or <https://www.uwinnipeg.ca/accessibility-services/> to discuss appropriate options. All information about a student's disability or medical condition remains confidential.
6. Reference to the appropriate items in the Regulations & Policies section of the Course Calendar, including Senate **appeals and academic misconduct** (e.g. plagiarism, cheating) <https://www.uwinnipeg.ca/academics/calendar/docs/regulationsandpolicies.pdf> Instructors should become familiar with the procedures for dealing with alleged academic misconduct at <https://www.uwinnipeg.ca/institutional-analysis/docs/policies/academic-misconduct-procedures.pdf>
7. **Avoiding Academic and Non-academic Misconduct.** Students are encouraged to familiarize themselves with the Regulations and Policies found in the University Academic Calendar at <https://www.uwinnipeg.ca/academics/calendar/docs/regulationsandpolicies.pdf> . Particular attention should be given to subsections 8 (Student Discipline), 9 (Senate Appeals), and 10 (Grade Appeals). It cannot be stressed enough the importance of maintaining academic integrity and the potential consequences or engaging in plagiarism, cheating and other forms can be quite severe. Even unintentional plagiarism, as described in the UW Library video tutorial "Avoiding Plagiarism" (<https://www.youtube.com/watch?v=UvFdxRU9a8g>), is a form of academic misconduct. Similarly, uploading essays and other assignments to essay vendor or trader sites (filesharing sites that are known providers of essays for use by others who submit them to instructors as their own work) is a form of misconduct, as it involves aiding and abetting plagiarism. Important information is outlined in the Academic Misconduct Policy and Procedures: <https://www.uwinnipeg.ca/institutional-analysis/docs/policies/academic-misconduct-policy.pdf> and <https://www.uwinnipeg.ca/institutional-analysis/docs/policies/academic-misconduct-procedures.pdf>.
8. **Privacy.** Students should be reminded of their rights in relation to the collecting of personal data by the University (<https://www.uwinnipeg.ca/privacy/admissions-privacy-notice.html>), especially if Zoom (or equivalent) is being used for remote teaching (<https://www.uwinnipeg.ca/privacy/zoom-privacy-notice.html>) and testing/proctoring (<https://www.uwinnipeg.ca/privacy/zoom-test-and-exam-proctoring.html>).
9. **Misuse of Filesharing Sites.** Uploading essays and other assignments to essay vendor or trader sites (filesharing sites that are known providers of essays for use by others who submit them to instructors as their own work) involves "aiding and abetting" plagiarism. Students who do this can be charged with Academic Misconduct.
10. **Avoiding Copyright Violation.** Course materials are owned by the instructor who developed them. Examples of such materials are course outlines, assignment descriptions, lecture notes, test questions, and presentation slides. Students who upload these materials to filesharing sites, or in any other way share these materials with others outside the class without prior permission of the instructor/presenter, are in violation of copyright law and University policy. Students must also seek prior permission of the instructor /presenter before photographing or recording slides, presentations, lectures, and notes on the board.
11. **Academic Integrity and AI Text-generating Tools** Students must follow principles of academic integrity (e.g., honesty, respect, fairness, and responsibility) in their use of material obtained through AI text-generating tools (e.g., ChatGPT, Bing, Notion AI). If an instructor prohibits the use of AI tools in a course, students may face an allegation of academic misconduct if using them to do assignments. If AI tools are permitted, students must cite them. According to the MLA (<https://style.mla.org/citing-generative-ai/>), "you should (1). cite a generative AI tool whenever you paraphrase, quote, or incorporate into your own

work any content (whether text, image, data, or other) that was created by it; (2). acknowledge all functional uses of the tool (like editing your prose or translating words) in a note, your text, or another suitable location; and (3). take care to vet the secondary sources it cites". If students aren't sure whether or not they can use AI tools, they should ask their professors.

12. **Research Ethics.** Students conducting research interviews, focus groups, surveys, or any other method of collecting data from any person, including a family member, must obtain research ethics approval before commencing data collection. Exceptions are research activities done in class as a learning exercise. For submission requirements and deadlines, see <http://www.uwinnipeg.ca/research/human-ethics.html> .
13. **Respectful Working and Learning Environment Policy.** Students are expected to conduct themselves in a respectful manner on campus and in the learning environment irrespective of platform being used. Behaviour, communication, or acts that are inconsistent with several UW policies could be considered non-academic misconduct. See the Respectful Working and Learning Environment Policy (<https://www.uwinnipeg.ca/respect/respect-policy.html>) and Acceptable Use of Information Technology Policy (<https://www.uwinnipeg.ca/institutional-analysis/docs/policies/acceptable-use-of-information-technology-policy.pdf>). More detailed information is outlined in the Non-Academic Misconduct Policy and Procedures (<https://www.uwinnipeg.ca/institutional-analysis/docs/student-non-academic-misconduct-policy.pdf> and <https://www.uwinnipeg.ca/institutional-analysis/docs/student-non-academic-misconduct-procedures.pdf>).
14. **Indigenous students** seeking additional supports, academic or other, are encouraged to contact the Aboriginal Student Services Centre (ASSC). The ASSC offers a variety of support services, and was created to maintain a safe, educational and culturally sensitive environment for all Aboriginal students (First Nation, Metis and Inuit) as they pursue their academic studies at The University of Winnipeg. More information can be found at: <http://www.uwinnipeg.ca/assc/> .
15. **Exam/Test Policies:** As a result of on-line instruction, students may be asked to turn on their camera and show their face alongside their university ID to prove their identity. If exams are in person, students will be required to show their University Issued ID.
16. **Missed Test/Exam Policy:** There are six acceptable excuses for an individual missing an exam or test. They are:
 - a. **Illness:** I will need an official certificate from your doctor verifying that you have a medical condition that precluded you from writing the schedule exam/test. *The note must indicate either the day(s) you were unable to attend class and/or the return to work/school date, not simply the day you were seen by the medical practitioner.* You will also be required, within reason, to notify the instructor as early as possible prior to, or immediately after the scheduled date. An email will suffice.
 - b. **Funeral Attendance:** I will need proof of funeral attendance with the date of the ceremony clearly listed.
 - c. **Mandatory Courtroom Appearance:** I will need a copy of your official court summons with the date of attendance clearly listed.
 - d. **Athletic Participation and other Approved University Activities:** I will need a signed letter from a member of the senior coaching staff, program director, instructor, or other supervisory individuals indicating the day(s) you will be absent.
 - e. **Inclement Weather:** Bad weather happens, if you are held up because of poor travel conditions contact the instructor as soon as possible to make alternate arrangements. In this situation the test/exam will be made-up later the same day or the following day, whenever possible.
 - f. **Religious Holiday:** Students may choose not to attend classes or write examinations on holy days of their religion, but they must notify their instructors at least two weeks in advance. Instructors will then provide opportunity for students to make up work examinations without penalty. A list

of religious holidays can be found in the 2020-2021 Undergraduate Academic Calendar.

<http://uwinnipeg.ca/academics/calendar/docs/important-notes.pdf>.

17. In all situations, the makeup test/exam will occur **within 5 school days** of the missed date. In the event of illness this deadline will be **within 5 school days** from the “**return to work**” date noted on the medical certificate. It is the student’s responsibility to schedule the makeup exam. Failure to schedule within the defined timeline will result in a grade of zero (0) for that test/exam.
18. **Final Exam Deferrals:** A legitimate exam conflict is defined as two (2) exams scheduled at the same time. You need to identify early any conflicts that may exist. Conflicts should attempt to be resolved by the student and the instructor(s), if a resolution cannot be reached students must submit the appropriate formal appeal (<http://www.uwinnipeg.ca/index/exam-conflict>). It is the student's responsibility to initiate the resolution of any conflicts. *Personal conflicts such as travel plans, and work schedules do not warrant a change in examination times. The date, time and location of the final exam are contained in this syllabus.*
19. **Late Penalties:** Assignments submitted late (and without a valid excuse) will be assessed a late penalty of 10%/day reduction in grade to a maximum of a 50% reduction whereby the assignment will be awarded a grade of zero (0).
20. **Course Communication:** Students are reminded that only their University of Winnipeg email address will be used for course related correspondence or through the email system on NEXUS. The instructor may not respond to messages that do not originate from either of these sources. Students have the responsibility to regularly check their UWinnipeg e-mail addresses to ensure timely receipt of correspondence from the University and/or their course instructors.
21. **Make-Up or Bonus Work:** There will be NO make-up work or bonus material of any kind.

The information presented in this course is the intellectual property of the instructor(s) and is presented for the benefit of registered students only. Any audio, video, or virtual reproduction of the lectures or labs, either in whole or in part, without the express written consent of the instructor(s) is strictly prohibited. In the event of extenuating circumstances, I reserve the right to make changes to any information presented in this document, after consulting with, or with the approval of, the class. Changes in test dates require the unanimous approval of those who were in attendance in class when the changes were discussed.