

The University of Winnipeg
Department of Geography

GEOG 2316 (3)-001
Introduction to Remote Sensing

Winter Term: T/Th 1:00 pm – 2:15 pm 3BC56
Labs: 070 (Monday 11:30 am -1:20 pm) Lockhart Hall 5L25
071 (Thursday 2:30 pm -4:20 pm) Lockhart Hall 5L25

Instructor: Dr. Joni Storie
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Phone: 204-258-3862
Office: 5L05
Office Hours: Tuesday and Thursday 11:00 am – noon.

**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-2316 (3) Introduction to Remote Sensing (3 hrs Lecture | 2 hrs Lab) This course introduces the principles of remote sensing and image analysis with a focus on the physics, sensor technology, processing, interpretation, and applications of remotely sensed imagery with a specific emphasis on optical sensors and technologies.

Restrictions: Students may not hold credit for this course and GEOG-3304.

Requisite Courses: GEOG-2304 or permission of the instructor [prerequisite(s)]; GEOG-2316L (lab) (must be taken concurrently).

Course Learning Objectives

This course introduces the principles of remote sensing and image analysis with a focus on optical data (visible and near infrared) including data acquisition, processing, interpretation, and applications.

The primary objectives for this course are to:

1. Understand and apply the properties of electromagnetic radiation as they relate to remote sensing;
2. Describe the characteristics and appropriate applications of different passive and active sensors used for image data collection;
3. Explore methods of visual interpretation of imagery from digital sensors;
4. Apply the principles of basic digital image processing for information extraction; and
5. Understand the relationships between remote sensing and GIS in context of resource assessments.

Required Textbook

There is no official textbook for the course. There are introductory text books available in the library, any version will do. Additional materials related to this course will be available on Nexus. All materials posted on NEXUS within the course content areas are required reading unless otherwise stated. Students should consider all posted materials as suitable content for exams.

Suggested Texts (for those that wish to use one):

Jensen, J. R., & Lulla, K. (any version). Introductory digital image processing: a remote sensing perspective.

Lillesand, T., Kiefer, R. W., & Chipman, J. (any version). Remote sensing and image interpretation. John Wiley & Sons.

NEXUS

Documents related to this course (e.g., course syllabus, project guidelines, lecture slides, supplemental readings) will be made available to students through the Nexus system. You must be registered in the course to have access to these materials. To login in to 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.

Term Dates of Significance:

| | |
|-----------|--|
| Jan 08 | TERM LECTURES BEGIN for the 2024 Winter |
| Feb 18-24 | Winter Term Reading Week. No classes. |
| Mar 15 | FINAL DATE to withdraw without academic penalty from courses which begin in January 2024 and end in April 2024 of the 2024 Winter Term. |
| Apr 5 | LECTURES END for the 2024 Winter Term. |
| April 8 | GOOD FRIDAY (Make up day for March 29) |
| Apr 11-24 | The Winter Term evaluation period for final items of work for this term which can include scheduled tests, exams, or the submission of papers or projects. |

Student Evaluation

Students are required to show identification for exams in this course.

Informed the instructor immediately if there is a need to reschedule midterm exam because of approved documented rationale (illness, funeral, court appearance, inclement weather). Makeup exam will occur within 5 school days of the missed date (or if illness "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 exam. *Personal conflicts such as travel plans and work schedules do not warrant a change in examination times.*

The course is broken down into two major components. A theoretical component which comprises classroom materials and their associated tests and exams (60% of course grade) and an applied component represented by the laboratory assignments and exam (40% of course grade).

Lab 070 (Monday 11:30 am -1:20 pm) Lockhart Hall 5L25

Lab 071 (Thursday 2:30 pm -4:20 pm) Lockhart Hall 5L25

The expectations for lab assignments will be verbally delivered during the lab time. All assignments are due at the start of following lab time. It is the responsibility of the student to ensure that the files are submitted in a readable format (e.g., Microsoft Word, ppt, pdf). Citations and references should be submitted in a consistent manner (choose APA Style or Chicago style, and stick with it). More information about styles are available from the library. When looking at citation style, it is important to observe style conventions regarding punctuation, capitalization, use of initials, indentation, identification of cities, etc.)

Lab assignments are graded on a three-point scale (**0**-poor/not submitted, **1**-acceptable, **2**-excellent). Assignments are due at the beginning of the student's lab session on the due date specified in the assignment handout. No late lab submissions will be accepted unless there is a documented rationale. The **2-hour lab exam** represents an accumulation of the material covered within the lab exercises and is designed to test and ensure students can complete the necessary tasks without assistance (not open book).

| Component | Date (Due) | Percent of Final Grade | |
|-------------------------------------|---|--|------------|
| Mid-Term Exam | February 15, 2024 | 25% (theory) | |
| Final Exam | TBD - Apr 11-24 IN PERSON | 35% | |
| Lab #1: Image Acquisition | | 2% | |
| Lab #2: Image Interpretation | | 2% | |
| Lab #3: Image Quality Assessment | | 2% | |
| Lab #4: Image Enhancements | Assignments are due at the beginning of the student's lab session on the due date specified in the assignment handout. | 2% | |
| Lab #5: Unsupervised Classification | | 2% | |
| Lab #6: Supervised Classification | | 2% | |
| Lab #7: Change Detection | | 2% | |
| Lab #8: Accuracy Assessment | | 2% | |
| Lab Exam | | Monday April 1st or Thursday April 4th lab period; attend your official registered lab period | 24% |

*Dates and times are subject to change. Where a discrepancy exists the official university final exam schedule will supersede the above date (<http://www.uwinnipeg.ca/exam-schedules/>)

Course Organization

The following course organization outlines the topics to be discussed during lectures. The order, dates, and proposed content of the presentations are subject to change as circumstances dictate; for example the change of term beginning date to January 8th. We may also not be able to cover the entire curriculum due to the interest of the class in examining in more detail some of the topics compared to others.

| Week Of | Topic | Lab Assignment |
|---------|--|--|
| 1 | Introduction to Remote Sensing and Data Collection | No Lab this week |
| 2 | Energy Sources and Radiation Principles | Lab #1: Image Acquisition |
| 3 | Principles of Image Interpretation | Lab #2: Image Interpretation |
| 4 | Image Quality Assessment and Statistical Evaluation | Lab #3: Image Quality Assessment |
| 5 | Image Enhancements | Lab #4: Image Enhancements |
| 6 | Midterm Review Midterm Exam (Feb 15) | Lab #5: Unsupervised Classification |
| 7 | Feb 18-24 - Reading Week - No Classes | |
| 8 | Thematic Information Extraction | Lab #6: Supervised Classification |
| 9 | Change Detection Accuracy Assessment | Lab #7: Change Detection |
| 10 | Information Extraction Using Artificial Intelligence | Lab #7: Two-week lab from last week |
| 11 | Hyperspectral, LIDAR | Lab #8: Accuracy Assessment and Final Map Production |
| 12 | RADAR Remote Sensing | Lab Exam Practice |
| 13 | Applications in Remote Sensing | Lab Exam (April 1 or 4) |

**All topics listed on the outline may not be covered depending on student interest and time. Topics are also dependent on visiting guest lectures by professionals who use geomatics.*

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 | 84-89.9 % | C | 56-64.9% |
| A- | 80-83.9% | 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.



THE UNIVERSITY OF WINNIPEG

1. When it is necessary to cancel a class due to exceptional circumstances, I will make every effort to inform students via uwinnipeg or Nexus email (and/or using the preferred form of communication, as designated in this outline), as well as the Departmental Assistant and Chair/Dean so that class cancellation forms can be posted outside classrooms.

2. Students are reminded that they have a responsibility to regularly check their uwinnipeg or nexus e-mail addresses to ensure timely receipt of correspondence from the University and/or their course instructors.

3. Please note that withdrawing before the VW date does not necessarily result in a fee refund.

4. The first day of class is January 8, 2024. Last class will be held on April 5, 2024. Evaluation period is Apr 11-24, 2024.

[See <https://www.uwinnipeg.ca/academics/calendar/docs/dates.pdf> for all dates]

5. 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 or examinations without penalty. A list of religious holidays can be found in the 2023-24 Undergraduate Academic Calendar.

6. 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.

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 2023-2024 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 /Nexus 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.

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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.