GEOG 4231 Remote Sensing
Department Geography and the Environment
Fall 2024

Instructor Information
     Instructor: Dr. Muditha Heenkenda
     Office Location: RC 2006E
     Telephone: 807 343 8010 ext. 8746
     E-mail: muditha.heenkenda@lakeheadu.ca
     Office Hours: MW 2.30 pm-3.30 pm and Tu 10.30 am-12.30 pm

Lab Instructor Information
     Instructor: Mr. Jason Freeburn
     Office Location: RC 2004
     Telephone: 807 343 8010 ext. 7890
     E-mail: jason.freeburn@lakeheadu.ca
     Office Hours: TBA

Teaching Assistant (TA) Information: NA

Course Identification
     Course Number: GEOG 4231
     Course Name: Remote Sensing
     Course Location: RC 2003 & ATAC 3009
     Class Times: Monday & Wednesday 1.30 pm to 2.30 pm (Lec); Tuesday 8.30 am-10.30 am (Lab)
     Prerequisites: Successful completion of GEOG 2232 Introduction to Geomatics and GIS course or equivalent course

Course Description/Overview
Introduces the fundamental principles of remote sensing. Students become familiar with the image processing workflow—image pre-processing, image enhancement, feature extraction (pixel-based and object-based classifications), and calculating vegetation indices. Hands-on experience in commonly used digital image processing tasks using state-of-the-art ENVI software. Lab exercises stimulate remote sensing activities in natural resource management, such as feature extraction, change detection and biophysical modelling. A term project will provide an opportunity to increase students' knowledge of a specific remote sensing application.

Course Learning Objectives

Upon successful completion of this course, students will be able to:
- understand the basic physical principle of remote sensing;
- describe the general procedure (big picture) of remote sensing;
- identify different types of remote sensing data, sensors and platforms and their applications;
- apply radiometric and atmospheric corrections for images;
- use different image processing techniques for data extraction using ENVI software, and
- gain knowledge and skills in project management by working for an extended period to investigate and respond to a real-world problem/challenge using remote sensing.

Course Resources

Course Website(s)
- Access to the course D2L site link will be provided upon registration.

Required Course Text(s)

- Required: Lillesand, T.M., Kiefer, R.W., and Chipman, J.W., 2015. Remote Sensing and Image Interpretation, 6th Edition (New Jersey: Wiley), ISBN 978-1-118-34328-9

  ebook for renting: https://www.wiley.com/en-ca/Remote+Sensing+and+Image+Interpretation%2C+7th+Edition-p-9781119128465

Course Schedule/Outline

Week	Monday	Wednesday	Lab (Tuesday)	Reading
Sept 2	**No classes (Labour Day)**	Introduction to Remote Sensing	**No lab this week**	
9	Electromagnetic energy and displaying images on a screen	Interaction of EM with the atmosphere, spectral signatures	Introduction to ENVI software, image display and creating spectral signatures	Chapter 1.1 – 1.7
16	Image and sensor characteristics	Earth Observation satellites and characteristics	Online data catalogues, data acquisition and display	Chapter 1.8 – 1.11 Chapt. 5
23	Atmospheric interactions, image corrections (geometric and radiometric)	Earth Observation satellites and identify sensors for different applications	Image pre-processing, atmospheric and radiometric corrections	
30	Image enhancement, pansharpening Image transformations and spectral indices	Image enhancement, image transformations and spectral indices	Image enhancement – contrast stretching and filtering, pan sharpening and creating vegetation indices	Chapters 4 and 5
Oct 07	Midterm test review	Digital image classification – supervised and unsupervised	**_Midterm test (lab)_**	Chapter 7.1 - 7.6
14	**_Fall Study Break_**			
21	Post classification smoothing, Classification accuracy assessment	Classification accuracy assessment	Image classification and accuracy assessment	Chapter 7.7 – 7.14
28	Object Based Image Analysis	Biophysical modelling	Object Based Image Analysis	Chapter 7.15, 7.17
Nov 4	Change detection	Advanced image processing algorithms (Machine learning)	Change detection	Chapter 7.15, 7.18,7.22
11	Introduction to the Term Project	Term project/GIS Day	Biophysical modelling - analyzing the percentage of vegetation coverage over a large area	Chapter 7.16, 7.18 – 7.23 Chapter 8
18	Term project	Term project	Term project	
25	Term project	Final exam review	Term project presentations in class	
Dec 2	**_No classes this week._**			

Assignments and Evaluations

Item	Date(s)	Value
In-class Assignment(s)	Each week, submit before the next class	40%
Quizzes	TBA	5%
Mid-Term test	Tuesday, Oct 08, 2024, from 8.30 - 10.30 am	15%
Final test	TBA	15%
Term project presentations	Due on Nov., 26, 2024	25%
Total		100

Late Assignments

Late Assignments receive a deduction of 10% per day unless an extension is agreed to with the instructor before the due date. After class assignments are graded and returned, late assignments receive a zero grade but must be satisfactorily completed to receive credit in the course.

Assignments

Detailed instructions for each assignment and required data and rubrics will be distributed via the course site.

Course Policies

- Attendance is expected for each lecture and lab unless communicated with the instructor ahead of time.
- Participation is expected in all class discussions and collaborative efforts (GIS Day).
- For the behavioural standards please refer to the Code of Student Behaviour and Disciplinary Procedures, also known as The Code.
- Exams (a) absences from illness, compassionate reasons or representing the university off-campus, supported by written documentation, will be accepted as sufficient evidence to allow a rewrite of a missed test.

  (b) If you miss an exam for any reason other than those deemed acceptable in the Lakehead University calendar, then you will be given the opportunity of an essay-based makeup exam that is significantly longer and more difficult.

Regulations – General Information from the Academic Calendar

"It is the responsibility of each student registered at Lakehead University to be familiar with, and comply with all the terms, requirements, regulations, policies and conditions in the Lakehead University Academic Calendar. This includes, but is not limited to, Academic Program Requirements, Academic Schedule of Dates, University and Faculty/School Policies and Regulations and the Fees and Refund Policies and Schedules."

Collaboration/Plagiarism

Plagiarism is defined in [University Regulation IX](#) with additional examples in Article I, Section 1 of The Code. Sanctions associated with Academic Misconduct are defined in Article II of The Code and Enforcement Procedures are outlined in Article III of The Code.

Students wishing to learn more about Academic Misconduct are encouraged to read the [University and relevant Faculty Regulations](#) and The Code (noted above) and access other resources on the [Teaching Commons](#) website.

University Policies – all University Policies can be found [here](#). Pay particular attention to those found under the Category of "Regulations" and "Student-Related". If you have a question, please let me know by email or in-class. If you have a question, it is likely that at least a few others in the class are wondering the same thing.

ChatGTP & Other AI Tools

Students wishing to learn more about using ChatGTP and other AI tools in class should refer to this [link](#).

Supports for Students – there are many resources available to support our students. These include but are not limited to:
- [Health and Wellness](#)
- [Student Success Centre](#)
- [Student Accessibility Centre](#)
- [Library](#)
- [Academic Support Zone](#) (Writing and Math Tutoring Centre)

Lakehead University is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities and/or medical conditions to ensure they have an equitable opportunity to participate in all of their academic activities. If you are a student with a disability and think you may need accommodations, you are strongly encouraged to contact Student Accessibility Services (SAS) and register as early as possible. For more information, please contact Student Accessibility Services http://studentaccessibility.lakeheadu.ca (SC0003, 343-8047 or sas@lakeheadu.ca)

Additional Information
- Please communicate with your lab instructor about using ATAC 3009 out of lab hours
- Each lab assignment is attached to a lab report rubric on the D2L site.