GEOG 4321 Remote Sensing
Department Geography and the Environment
Fall 2022

Instructor Information
Instructor: Dr. Muditha Heenkenda
Office Location: RC 2006E
Telephone: 807 343 8010 ext. 8746
E-mail: muditha.heenkenda@lakeheadu.ca
Office Hours: TBA

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 4321
Course Name: Remote Sensing
Course Location: RC 2003 & ATAC 3009
Class Times: Wednesday & Friday 3.30 pm to 4.30 pm (Lec); Friday 12.30 pm to 2.30p m (Lab)
Prerequisites: Successful completion of GEOG 2232 Introduction to Geomatics and GIS course or equivalent course

Course Description/Overview
Remote Sensing course will introduce the fundamentals of the basic physical principle of remote sensing. The course is designed to stimulate the current remote sensing activities in natural resource management. Students become familiar with the basic image processing techniques for image pre-processing and data extraction. The lab exercises include many commonly used digital image processing tasks and utilization of ENVI software. A term project will be introduced to allow the opportunity to increase students' knowledge on a specific application of remote sensing technology.

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; and
- successfully apply different image processing techniques for data extraction using ENVI/QGIS software.

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-9781118919477

Course Schedule/Outline

Week	Wednesday	Friday	Lab (Friday)	Reading
Sept 5	Introduction to Remote Sensing	Aerial image capturing using a Remotely Piloted Aircraft System and ground truth data collection for digital image classification in week 7		
12	Electromagnetic energy and displaying images on screen	Interaction of EM with the atmosphere, spectral signatures	Introduction to ENVI software, image display and creating spectral signatures	Chapter 1.1 – 1.7
19	Image and sensor characteristics	Earth Observation satellites and characteristics	Online data catalogues, data acquisition and display	Chapter 1.8 – 1.11 Chapt. 5
26	Earth Observation satellites and identify sensors for different applications	Atmospheric interactions, image corrections (geometric and radiometric)	Image pre-processing, atmospheric and radiometric corrections	
Oct 3	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
10	*Fall Study Break*			
17	Midterm test review Term project discussion	Digital image classification – supervised and unsupervised	*Midterm test (lab)*	Chapter 7.1 - 7.6
24	Post classification smoothing, Classification accuracy assessment	Classification accuracy assessment	Image classification and accuracy assessment	Chapter 7.7 – 7.14
31	Object Based Image Analysis	Biophysical modelling	Object Based Image Analysis	Chapter 7.15, 7.17
Nov 7	Change detection	Advanced image processing algorithms (Machine learning)	Change detection and analyzing the percentage of vegetation coverage over a large area using NDVI	Chapter 7.15, 7.18, 7.22
14	GIS Day	Introduction to term project	Compare different image processing algorithms	Chapter 7.16, 7.18 – 7.23 Chapter 8
21	Term project	Term project	Term project	
28	Term project	Final exam review	Term project presentations in class	
Dec 5	*No classes (the last day of instruction is Tuesday, Dec 6, 2022)*			

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	Friday Oct 21 2022 from 12.30 -2.30 pm	15%
Final test		20%
Term project presentations	Due on Dec, 2nd 2022	20%
Total		100

Late Assignments

Late Assignments receive a deduction of 10% per day unless an extension is agreed to with the instructor prior to 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 of each assignment, required data and rubrics will be distributed via course D2Lsite.

Course Policies

- **Attendance** is expected for each lecture and lab unless communicated with the instructor ahead of time. At the end of each lecture, a quiz is open for a limited period (worth 5% of the total course).
- **behavioural standards,** please refer to the Code of Student Behaviour and Disciplinary Procedures also known as The Code,
- Participation is expected in all class discussions, group work and collaborative efforts.
- **Exams** (a) Student must obtain a minimum average grade of 50% on exams. If your exam average is not above 50% on these two exams, the lab and term paper marks will be dropped and your final mark will be based on the exams only.
  (b) If you miss an exam for any reason other than those deemed acceptable in 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.

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
- NA