GEOG 4231 – REMOTE SENSING (F21)

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Course Description:

The course: Remote Sensing 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 paper will be introduced for allowing the opportunity to increase students' knowledge on a specific application of remote sensing technology.

Learning Outcomes:

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.

Learning Resources:

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

Grading:

Term project	25%
Quizzes	5%
Lab exercises	40%
Midterm exam	15%
Final exam	15%

Course Expectations/Student Responsibilities:

1. **Attendance** is expected for each lecture and lab unless communicated with the instructor ahead of time. At the end of each lecture, there is a quiz open for a limited time period (worth 5% of the total course).
2. **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.**
3. **Participation** is expected in all class discussions, group work and collaborative efforts.
4. **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.

5. **Citations Style:** For this course, please use the APA citation style.

Course Schedule:

Week	Monday	Wednesday	Lab exercise (Wed)	Reading
Sept 6	No class (Labor Day)	Introduction to Remote Sensing	No lab this week – literature review for term project – Precision Agronomy and RS	
13	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
20	Image and sensor characteristics Visual image interpretation	Earth Observation satellites and characteristics	Online data catalogues, data acquisition and display	Chapter 1.8 – 1.12
27	Earth Observation satellites and identify sensors for different applications	Atmospheric interactions, image corrections (geometric and radiometric)	Image pre-processing, atmospheric and radiometric corrections	Chapters 4 and 5
Oct 4	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 indices	Chapter 7.1 - 7.6
11	***Fall Study Break***			
18	Midterm test review Term project discussion	Digital image classification – supervised and unsupervised	***Midterm test (lab)***	Chapter 7.7 – 7.14
25	Post classification smoothing, Classification accuracy assessment	Classification accuracy assessment	Image classification and accuracy assessment	Chapter 7.14, 7.17
Nov. 1	Object Based Image Analysis	Biophysical modelling	Object Based Image Analysis	Chapter 7.15, 7.22
8	Change detection	Microwave and LiDAR Remote Sensing	Change detection and analyzing percentage of vegetation coverage over a large area using NDVI	Chapter 7.18 – 7.23 Chapter 6
15	Applications of Remote Sensing/Review	Introduction to term project – Precision Agronomy and RS	LiDAR applications	Chapter 8
22	Term project	Term project	Term project	
29	Term project	Final exam review and term project	***Final Exam (lab)***	
Dec. 6	Term project discussion	***No classes***		

Note that this document is subjected to change pending unforeseen circumstances.