GEOG 484 LEC01 Remote Sensing Essentials
GFC Hours 3-2
Fall 2023 classes: Sept 5th – Dec 6th, 2023.

Section	Days	Time	Location
LEC 01	Tu/Th	12:30 - 1:45PM	SB 144
LAB 01	Tu	3:00 - 4:50PM	ES 407
LAB 02	W	11:00AM - 12:50PM	ES 415

Instructor: Dr. Geoff Hay	Office: ES 304
TA: Olivia Gray	Office: TBA
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Email communication will be through your UCalgary email address.	Office hours: By appointment only

*The **Department of Geography** condemns the longstanding and continued injustices against those marginalized by racism, sexism, homophobia, transphobia, classism, xenophobia, able-bodied normativity, mental health profiling, and other forms of prejudice. We are pained by the fact that injustices are unevenly borne.* https://arts.ucalgary.ca/news/anti-racism-statement

Territorial Acknowledgement
The Department of Geography would also like to acknowledge the traditional territories of the people of the Treaty 7 region in southern Alberta. The City of Calgary is also home to Métis Nation of Alberta, Region III. https://www.ucalgary.ca/indigenous/cultural-protocol

Official Course Description
Instruction in the background, use and interpretation of remote sensing imagery. Labs and topics introduce fundamental principles of raster-based image analysis, visualization, and classification. Labs will include identification, interpretation, and mapping of both physical and cultural landscape features.

Course Objectives
The course will include instruction in theory, knowledge, use and interpretation of remote sensing imagery. Specific labs will engage students in the identification, interpretation and mapping of both physical and cultural landscape features, as well as multi-band land-cover/land-use classifications and multi-temporal analysis. Students will learn to use state-of-the art digital image processing software to solve real-world processing challenges. They will also gain practical experience using remote sensing technologies for science/resource management and develop technical/scientific writing skills through lab reports.

Course Learning Outcomes
The Department of Geography is committed to student knowledge and skill development. The table below lists the key learning outcomes for this course, the program-learning outcomes to which they contribute, and the expected level of achievement.

Course Learning Outcomes	PLO(s)	Level(s)
Identify characteristics of EMR production, transmission & reflection: use wavelength & frequency fluently.	2	1,2
Describe RS history of space and airborne technology @ its current influence.	2	1,2
Perform reflectance & radiance calibrations & correct for atmosphere influence.	3,4,6	2,3
Manipulate data layers, creating colour composites, enhance and visually evaluate satellite and airborne digital images.	3,4,6	1,2
Perform neighbourhood operations on digital images to exploit spatial structure.	4,5,6	1,2
Explain and critique the foundations of RS – including EMR spectrum, energy-matter	2,5,7	1,2

interactions & the elements of image interpretation.		
Explain and perform RGB colour theory and contrast-enhancements to display multi-band images.	**4,5,6**	**1,2**
Explain and perform methods of geometric and radiometric corrections and know when to apply them & to what kinds of data.	**4,5,6**	**1,2**
Explain & perform basic image transforms: PCA, Veg Indices, Image Algebra, etc.	**4,5,6**	**1,2**
Explain and perform all aspects of classification: supervised/unsupervised, including training and test class selection and accuracy assessments.	**2,3,4,5,6**	**2,3**
Explain/critique strengths/limitations of pixel/object-based processing & MAUP.	**4,5,6,7**	**2,3**
Write technical reports using standard formats and citation standards.	**7,8**	**2,3**

*PLOs = Program Learning Outcomes: 1 = reflect and communicate diverse human-environment perspectives, 2 = identify and explain human-environment processes, 3 = implement sampling, data collection, analyses and communication methods, 4 = analyze spatial and temporal aspects of human-environment systems, 5 = employ knowledge, arguments, and methodologies for solving human-environment problems, 6 = evaluate geospatial data and manipulate it to create cartographic products, 7 = communicate geographic concepts using oral, written, graphic, and cartographic modes, and 8 = demonstrate literacy skills.
**Levels: 1 = Introductory, 2 = Intermediate, and 3 = Advanced.

Prerequisites
3 units from Geography 231, 380.

Learning Resources
No textbook is required for this course. However, numerous related textbooks are available for overnight sign out from the Resource room. The Internet will also serve as an invaluable resource for information in this course and a digital Remote Sensing Text created by CCRS will be provided (see link below). There are, however, several recommended textbooks that make for good general reference material. It would be advantageous for students to own, or gain access to one or more of the following texts:

- **Highly recommended**: Jensen, J. R., 2015: Introductory Digital Image Processing: A Remote Sensing Perspective. Prentice Hall. 4th Edition. pp 623.
- **Highly Recommended (Free):** ***Fundamentals of Remote Sensing (CCRS - Tutorial), 258 pp.* https://www.nrcan.gc.ca/maps-tools-and-publications/satellite-imagery-and-air-photos/tutorial-fundamentals-remote-sensing/9309
- **Highly Recommended (Free):** *** Intro. to Remote Sensing - compiled by Michael C. McGoodwin (MCM).* https://www.academia.edu/33507293/Introduction_to_Remote_Sensing
- *Lillesand, T. M, Keifer, R. W., Chipman, J. W., 2015. Remote Sensing and Image Interpretation. 7th Edition. Wiley, pp 720.*
- Northey, M. and D.B. Knight, 2012: Making Sense, A Student's Guide to Research and Writing in Geography and Environmental Sciences, Fifth Edition. Oxford University Press.

Assessment Methods

Item	Weighting	Dates (see Lab schedule on D2L for details)
Lab 1	10%	Week 38
Lab 2	10%	Week 40
Lab 3	10%	Week 43
Lab 4	15%	Week 47
Lab 5	10%	Week 49
Midterm 1	15%	▪ 12:30 - 1:45 PM on Thursday Oct 05, 2023
Midterm 2	15%	▪ 12:30 - 1:45 PM on Thursday Nov 09, 2023
Final Exam	15%	▪ 12:30 - 1:45 PM on Tuesday Dec 05, 2023
Total	**100%**	

All exams (midterms and finals) are closed book with NO Electronic devices and will take place in class (except for those taking place in the SAS[i]). The final exam (on the last day of classes) will **NOT** be scheduled by the Registrar's office.

- Only pens, pencils and erasers are allowed in exams. No other materials or devices are allowed.
- To pass the course, students **must receive a passing grade in both** the lecture component (i.e., combined scores from the midterm tests and final exam) and the laboratory assignments.

Missed assignments/labs/exams
- Students who miss a term test or assignment deadline will automatically receive a grade of zero (0) for that item in their course evaluation. If a student missed the test or assignment because of extenuating circumstances, they must contact the instructor immediately to discuss alternatives to the zero-grade received for the missed assessment. For example, given an appropriate excuse, *a missed examination may be reweighted onto other exams.* If a student knows they will be away (i.e., university sports activities) on the date of the exam, they need to contact the instructor before the exam to make alternative accommodations. If students abuse this opportunity, they will be referred to the Associate Dean's Office.
- Supporting documentation, such as a statutory declaration may be requested
  https://www.ucalgary.ca/pubs/calendar/current/m-1.html   Please refer to
  https://www.ucalgary.ca/registrar/registration/appeals/student-faq

Grading System

96 – 100	A+	77 – 80	B	59 – 61	C-
90 – 95	A	71 – 76	B-	55 – 58	D+
86 – 89	A-	65 – 70	C+	50 – 54	D
81 – 85	B+	62 – 64	C	0 – 49	F

Flexible Grade Option (CG Grade) https://www.ucalgary.ca/pubs/calendar/current/f-1-3.html

Posting of Grades and Picking-up of Assignments
- All student completed assignments will be posted to the appropriate Dropbox on D2L (TBA) for the TA to grade.
- Graded assignments will be made available electronically through the course D2L webpage.
- Grades and assignments will not be available at the Department of Geography's main office and assignments cannot be dropped off at the Department Office.
- Deadlines for lab submissions will be provided by the TA.

Course Format
This course will follow a traditional format where theory is taught in the lecture component and practical application of theory will occur in the lab component. Usually, relevant theory will be presented in lecture *before* the associated labs, but, due to the length of the term and scheduling restrictions, this will not always be the case. However, the instructor will do their best to teach the theory component in the same week as labs.

Lecture component will operate as follows:
- Lectures will occur T&TH from 12:30 - 1:45 PM in SB 144.
- The lectures will be dominated by PowerPoint presentations with episodic demonstrations and in-class activities/guest lectures when deemed appropriate.
- The instructor will have in-person and virtual office hours for additional assistance with course materials based on appointment only.

EXAMS:
NO electronic devices will be allowed in exams (unless specified by the instructor) including but not limited to laptops, tablets, cell phones, Apple/Android watches, etc.

Midterm Exam

Two midterm exams will take place during a scheduled lecture period. There cannot be an online accommodation for this exam so all students must complete the exam in the lecture theatre at the scheduled time (see Course Schedule). If necessary, see the information (above) on *Missed Exams.*

Final Exam

The final exam will take place during a scheduled lecture period. There cannot be an online accommodation for this exam so all students must complete the exam in the lecture theatre at the scheduled time (see Course Schedule). See *Missed Exams* (above) for additional information.

The Laboratory component will operate as follows:
- Students are expected to attend the lab section in which they are registered.
- There will NOT be a virtual (Zoom) option for the labs, but it is possible to use remote login options for software use (TBA).
- Where possible, the Teaching assistant will provide introductory videos for each lab which are to be watched by all students **prior** to attending the in-person lab to ensure the most productive use of the lab period.
- The Teaching assistant will be available during the lab period to answer lab-related questions.
- For additional help, the Teaching assistant will be available for office hours outside the lab – by appointment only. Please note that they will NOT be available 24/7.
- All labs will be completed digitally and submitted through D2L (no exceptions!).
- Due to space and scheduling restrictions, it may not be possible to attend other scheduled lab times (in which you are not registered) for additional time/help completing the lab exercises.

Exams & Deferrals &Tips https://www.ucalgary.ca/registrar/exams

Referencing Standard

In written work presented in this class, the accepted method for referencing the work of others will be the Chicago Manual of Style: https://www.chicagomanualofstyle.org/home.html - unless otherwise specified in specific Lab writeup information that will be provided by the TA in Labs.

Important Dates

See: https://www.ucalgary.ca/pubs/calendar/current/academic-schedule.html for important dates such as the last day to drop courses and receive a tuition fee refund**,** the last day to add or swap a course, the last day to withdraw from this course, and university closures.

> For additional detailed course information posted by the instructor, visit the course Desire2Learn page online at
> https://d2l.ucalgary.ca/d2l/home.

Resources and Writing support

Please note writing support resources provided by the Student Success Centre https://ucalgary.ca/ssc/resources/writing-support and the library https://libguides.ucalgary.ca/guides/

University of Calgary Academic Integrity Policy

Academic integrity is the foundation of the development and acquisition of knowledge and is based on values of honesty, trust, responsibility, and respect. We expect members of our community to act with integrity. The University Calendar includes a statement on the principles of conduct expected of all members of the university community (including students, faculty, administrators, any category of staff, practicum supervisors, and volunteers), whether on or off university property. This statement applies in all situations where members of the university community are acting in their university capacities.
University of Calgary : K. Integrity and Conduct (ucalgary.ca)

Plagiarism, Cheating, and Student Misconduct
- Academic dishonesty is not an acceptable activity at the University of Calgary, and students are **strongly advised** to read the Student Misconduct section in the University Calendar at: www.ucalgary.ca/pubs/calendar/current/k-3.html. Often, students are unaware of what constitutes academic dishonesty or plagiarism. The most common are (1) presenting another student's work as your own, (2) presenting an author's work or ideas as your own without adequate citation, and (3) using work completed for another course.
- Such activities will not be tolerated in this course, and students suspected of academic misconduct will be dealt with according to the procedures outlined in the calendar at: https://www.ucalgary.ca/legal-services/university-policies-procedures/student-academic-misconduct-procedure .
- For information on what constitutes plagiarism and how to properly cite the work of others, the Department of Geography recommends that they attend Academic Integrity workshops offered through the Student Success Centre: https://www.ucalgary.ca/student-services/student-success/learning/academic-integrity

Instructor Intellectual Property
Information on Instructor Intellectual Property can be found at https://www.ucalgary.ca/legal-services/university-policies-procedures/intellectual-property-policy

Freedom of Information and Protection of Privacy
Freedom of Information and Protection of Privacy (FOIP) legislation in Alberta regulates the return of term assessments. Term assignments will be returned to students individually, during class or during the instructor's office hours; if students are unable to pick up their assignments from the instructor, they must provide the instructor with a stamped, self-addressed envelope to be used for the return of the assignment. Grades and assignments will not be available at the Department of Geography's main office and assignments cannot be dropped off at the Department Office.

Research
Students will NOT participate as subjects or researchers on human subjects.

Posting of Grades and Picking-up of Assignments
Graded assignments will be returned by the instructor or teaching assistant personally during scheduled lectures or laboratory periods unless they are made available electronically through the course D2L webpage.

Academic Accommodations
It is the student's responsibility to request academic accommodations, according to the university policies and procedures listed in the University Calendar. The student accommodation policy can be found at: https://www.ucalgary.ca/pubs/calendar/current/b-6-1.html

Within the first week of classes, students needing an accommodation because of a disability or medical condition should register with Student Accessibility Services Accessibility | Home | University of Calgary (ucalgary.ca) Students needing an accommodation based on a protected ground other than disability should communicate this need, preferably in writing to their instructor or the Department Head (email: freeman@ucalgary.ca).

Learning Technologies and Requirements
To successfully engage in their learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology.
- A computer with a supported operating system, as well as the latest security and malware updates
- A current and updated web browser
- Broadband internet connection
- Optional technology: webcam (built-in or external) / microphone and speaker (built-in or external) or headset with microphone

Use of internet and electronic devices in class
- The internet and electronic devices (laptops, iPads, etc.) can be used in class but only for accessing class-related materials. Recordings require the **permission** of the instructor.

Guidelines for Video Sessions
- Video sessions may be used in the event of instructor absence, for work within peer groups, or for other communication related to course obligations. To help ensure video sessions are private, do not share links or passwords with others via any medium, including social media platforms. Links and passwords are only intended for students registered in the course.

- Recordings and materials presented, including any teaching materials, must not be shared, distributed or published without the instructor's permission.
- The use of video conferencing programs relies on participants to act ethically, honestly and with integrity; and in accordance with the principles of fairness, good faith, and respect (as per the Code of Conduct). When entering video conferencing sessions, you play a role in helping create an effective, safe, and respectful learning environment.
- Please be mindful of how your behaviour in these sessions may affect others. Participants are required to us names officially associated with their UCID (legal or preferred names listed in the Student Centre) when engaging in these activities. Instructors/moderators can remove those whose names do not appear on class rosters. Non-compliance may be investigated under the relevant University of Calgary conduct policies (e.g., Student Non-Academic Misconduct Policy).
- If participants have difficulties complying with this requirement, they should email the instructor of the class explaining why, so the instructor may consider whether to grant an exception and on what terms. For more information on how to get the most out of your sessions visit: eLearn @ UCalgary
- If you are unable to attend a session, please contact your instructor to arrange an alternative activity for the missed session (e.g., to
- review a recorded session). Please be prepared, as best as you are able, to join class in a quiet space that will allow you to be fully present and engaged in sessions. Students will be advised by their instructor when they are expected to turn on their webcam (for group work, presentations, etc.).
- The instructor may record online class sessions for the purposes of supporting student learning in this class – such as making the recording available for review of the session or for students who miss a session. Students will be advised before the instructor initiates a recording of a class session. These recordings will be used to support student learning only and will not be shared or used for any other purpose.

Media Recording (if applicable)
- <mark>Students DO NOT have permission to record lectures without the express permission of the instructor</mark>.
- Please refer to the following statement on media recording of students: https://elearn.ucalgary.ca/wp-content/uploads/2020/05/Media-Recording-in-Learning-Environments-OSP_FINAL.pdf

Course evaluations and student feedback
Student feedback will be sought at the end of the course through the standard University Student Ratings of Instruction (USRI) and Faculty course evaluation forms.

Accessibility
As most of this course involves the creation, use and editing of visual media (i.e., digital mapping, images, powerpoint), students will need to see the lecture (visually) to get all of the course information.

Copyright Legislation
All students are required to read the University of Calgary policy on Acceptable Use of Material Protected by Copyright https://www.ucalgary.ca/legal-services/university-policies-procedures/acceptable-use-material-protected-copyright-policy
and requirements of the copyright act (https://laws-lois.justice.gc.ca/eng/acts/C-42/index.html) to ensure they are aware of the consequences of unauthorised sharing of course materials (including instructor notes, electronic versions of textbooks etc.). Students who use material protected by copyright in violation of this policy may be disciplines under the Non-Academic Misconduct Act.

Wellness and Mental Health Resources
Mental health plays a pivotal role in physical health, social connectedness, and academic success and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support, or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, https://www.ucalgary.ca/wellnesscentre/services/mental-health-services and the Campus Mental Health Strategy website (http://www.ucalgary.ca/mentalhealth/).
  - Students requiring assistance are encouraged to email the **Student at Risk line** if they or others appear to need wellness assistance: sar@ucalgary.ca For more immediate response, please call: 403-210-9355 and select option #2.

Sexual Violence Policy
All members of the University Community should be able to learn, work, teach and live in an environment where they are free from harassment, discrimination, and violence. Please see the policy available at https://www.ucalgary.ca/legal-services/university-policies-procedures/sexual-and-gender-based-violence-policy

Contact Information for Student and Faculty Representation
- Student Union VP Academic 403-220-3911, suvpaca@ucalgary.ca
- Students Union Representatives for the Faculty of Arts – 403-220-3913, arts1@su.ucalgary.ca, arts2@su.ucalgary.ca, arts3@su.ucalgary.ca, arts4@su.ucalgary.ca
- Student Ombuds Office information can be found at: www.ucalgary.ca/ombuds/

Emergency Evacuation/Assembly Points
Assembly points for emergencies have been identified across campus. Assembly points are designed to establish a location for information updates from the emergency responders to the evacuees, from the evacuated population to the emergency responders. For more information, see the University of Calgary's Emergency Management website: https://www.ucalgary.ca/risk/emergency-management
Social Science Food Court

Campus Safewalk
Campus Security, in partnership with the Students' Union, provides the Safewalk service, 24 hours a day, to any location on Campus, including the LRT station, parking lots, bus zones, and university residences. Contact Campus Security at 220-5333 or use a help phone, and Safewalkers or a Campus Security officer will accompany you to your campus destination.

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[i] https://www.ucalgary.ca/student-services/access