UNIVERSITY OF
CALGARY

GEOG 684 L01 Fundamentals of Remote Sensing
GFC Hours 3-2
Fall 2023 classes: September 5th – December 6th, 2023.

Section	Days	Time	Location
Lec - L01 (Blended Learning)	Thursdays	11:00-12:15	ES 342
	Online lectures	Web-based	
Lab - B01	Thursdays	14:00-15:50	ES 407

Instructor: Dr. Darren Sjogren	Office: ES 456
Telephone: 403-220-2575	Email: sjogren@ucalgary.ca
Communication during the term will be in Microsoft Teams.	Office hours: Tuesdays and Thursdays. By appointment, contact in Microsoft Teams.

*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
Theoretical topics include physics of remote sensing data capture, sensor systems, representation, and data models, as well as the science behind techniques such as reflectance and radiance calibrations, atmospheric corrections, and image transformations. Applications include topics such as visual interpretation of imagery, supervised and unsupervised image classification, model validation, and accuracy assessment.

Course Objectives
The overall objective of the course is to develop a fundamental understanding of optical remote sensing technology and standard remote sensing techniques. The course will address many preprocessing and calibration techniques that are necessary for some remote sensing applications. Multiband image manipulations such as band compositing and contrast enhancements will be linked to visual interpretation. Other key techniques will be pixel- and object-based classification, image indices, neighbourhood operators, and Principal Components Analysis. The exercises and assignments in this course will primarily use Esri's ArcGIS Pro and ArcGIS Online software.

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)**
By the end of this course, a successful student will be able to:		
Manipulate data layers to create visualizations of multiband imagery	3,4,6,7	2
Describe EMR production and characteristics	2	2
Describe remote sensing historical development and its importance	2	2
Describe and interpret EMR-matter interactions	2,7	2
Explain and perform geometric and radiometric corrections	4,5,6	2
Perform and evaluate image transformation techniques	4,5,6	2
Perform and evaluate different image classification techniques	2,3,4,5,6	2

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

Consent of the Department.

Course Format

1. The 'Lecture' component consists of:
   a. Recorded lectures which students are expected to watch on their own time, prior to the in-person scheduled class period.
   b. Scheduled class periods will be a mixture of lecture and discussion. The discussion will focus on the recorded lectures.
   c. Assessment is based on quizzes, midterm, and a final exam.
2. The 'Laboratory' component consists of:
   a. Lab introductions will be presented by the TA during the formal lab period. This is usually 15-30 minutes long. Students are expected to attend these sessions. The TA will not repeat the introduction to students who do not attend the lab period. Students are encouraged to remain for the entire lab period so they can access the TA as issues arise.
   b. Lab components not completed during the formal lab period are to be completed on the student's own time. All submitted materials must be the student's own work (see Academic Integrity sections below). Consultation, for the purpose of problem solving, with other students is encouraged.
   c. The TA will have formal 'availability hours' to answer questions. Students will be expected to contact the TA using Teams (no email) to schedule a time for assistance.
   d. Assessment is based on lab assignments and a lab exam.

Assessment Methods

The following evaluation components will be used to determine the overall grade in this course.

Component #1 – Lecture

Quizzes (online)	06%
Midterm (October 19)	14%
Final exam (Registrar scheduled)	20%

Component #2 – Laboratory

Lab assignments	50%
Lab exam (November 30)	10%

Notes:
1. There **IS** a registrar scheduled final exam in this course.
2. To successfully pass this course, students must earn ≥ 50% for both Components indicated above. This means 20/40 for Component #1 and 30/60 for Component #2. If a student receives ≥ 50% on both Components, the final percent grade will be calculated using the weighting indicated above. The final letter grade will be determined using the Grading System below.

Further details about lecture topics, lab assignment topics and deadlines, quizzes, and examinations will be provided at the beginning of the course. The midterm and lab exam will be scheduled during the lecture period (see schedule), whereas the final exam will be Registrar scheduled. All examinations will be closed book. Quizzes will be open book.

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

Late Assignments and Missed Tests
- THERE WILL BE NO MAKEUP OR DEFERRED <u>MIDTERM</u> OR <u>LAB</u> EXAM under any circumstances. No examinations may be written early. Students who do not write the Midterm or the Lab Exam will have the weight of the missed exam shifted to the Final Exam. A statutory declaration for a missed midterm or lab exam is not required.
- You will be required to complete several laboratory assignments in this course. A due date and time will be posted for each assignment, and these deadlines are strict. If extenuating circumstances arise that will prevent you from completing an assignment by the deadline, contact your instructor **AND** teaching assistant <u>at least one business day before the deadline</u> to discuss whether an extension can be granted. <u>No extensions will be provided after the deadline</u>. Late submissions will be accepted at a penalty of 10% per calendar day, or any portion thereof, past the deadline (e.g., up to 24 hours late = 10% penalty, 24+ hours late = 20% penalty, 48+ hours late = 30% penalty, etc.).
- All assignments must be submitted online following the instructions provided. Submissions which do not follow the instructions will receive a "0%" (e.g., email submissions will not be accepted).

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

Supplementary Fees
Not applicable

Referencing Standard
In written work presented in this class, the two accepted methods for referencing the work of others will be (1) Chicago Manual of Style: https://www.chicagomanualofstyle.org/home.html or (2) American Psychological Association: https://apastyle.apa.org/products/publication-manual-7th-edition .

Important Dates
The last day to drop this course and receive a tuition fee refund is **Thursday, September 14th, 2023**. The last day to add or swap a course for Fall 2023 is **Friday, September 15th, 2022**. The last day to withdraw from this course is **Wednesday, December 6th, 2022**. Please note that the University is closed on Friday, September 30th; Monday, October 9th; and Friday, November 13th, 2023.

Learning Resources (Textbook and Readings)
The following textbook is **required**. Testable readings will be provided out of this text.

Jensen, J.E., 2016. Introductory Digital Image Processing: A Remote Sensing Perspective, 4th Edition. Pearson.

Additional required readings from other sources may be assigned – notifications will be posted online, and additional readings will not require purchase and be available through the UofC Library.

Learning Resources - Teams for Education Learning Management System
This course will use the Microsoft Teams for Education online learning management system for most online course materials and interaction (e.g., video calls, text-based chat, posting of lecture materials, recorded videos, assignment submission, online gradebook, etc.). *To use Microsoft Teams, students are required to enable multi-factor authentication (MFA) on their UCalgary Office365 accounts.* For more information on multi-factor authentication and how to get started, see LINK. For information on obtaining and installing Microsoft Teams, see LINK. A Microsoft Teams software client capable of video calls will be required for some course components.

Enrolled students will receive an invitation to the course Microsoft Teams workspace during the first week of the term. Note that Microsoft Teams will largely replace Desire2Learn (D2L) and Zoom for the delivery of online content in this course.

Learning Resources - 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
- Webcam (built-in or external)
- Microphone and speaker (built-in or external) or headset with microphone
- Broadband internet connection

Learning Resources – ArcGIS Pro and ArcGIS Online software
The exercises and assignments in this course will primarily use Esri's ArcGIS Pro and ArcGIS Online software. Students may obtain a licence to install ArcGIS Pro on their personal computers. ArcGIS Pro runs on the Windows operating system only, and system requirements for the software can be found on the software vendor's website LINK.

For Apple Mac users, it may be possible to install the Windows operating system on a Mac computer using either Apple's Boot Camp or a commercial virtualization client, such as Parallels Desktop or VMware Fusion for Mac, although these options are supported by the University of Calgary, and students must obtain and install necessary software themselves (student discounts are often available to offset the cost of purchasing commercial virtualization software and a licence for the Windows operating system). Interested students are advised to contact their instructor for more information.

Anyone with a University IT account can create an Esri Account for access to ArcGIS Online, Esri Training and ArcGIS Pro *without having to submit a request*. Updated instructions are available in the following articles, previous instructions have been removed.

- ArcGIS – Esri Account (How to access ArcGIS Online, ArcGIS Pro and Esri Training)
- ArcGIS Pro - Personal Computer (How to install and license ArcGIS Pro on a personal computer)

Existing ArcGIS Online users have a couple of options; continue to use their existing Esri Account or create a new Esri Account accessible through their University IT login. For details, please see the 'ArcGIS – Esri Account Options' article.

For students who are unable to run ArcGIS Pro on their home computers, shared access to a campus computer via a remote connection will be available. For remote access, students will require a Windows or Mac-based computer and a reliable broadband connection. Details on how to schedule time on a shared computer using a remote desktop session will be provided at the beginning of the course.

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. All members of the university community have a responsibility to familiarize themselves with the principles of conduct statement, which is available at: www.ucalgary.ca/pubs/calendar/current/k.html.

Plagiarism, Cheating, and Student Misconduct
The University of Calgary is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect.

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 students wishing to know more about 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

Human subjects
Students will not be expected to participate as research subjects or conduct research on human subjects.

Freedom of Information and Protection of Privacy

Freedom of Information and Protection of Privacy (FOIP) legislation in Alberta disallows the practice of having students retrieve assignments from a public place, such as outside an instructor's office, the department office, etc. 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.

Posting of Grades and Picking-up of Assignments

Graded assignments will be returned by the instructor or teaching assistant digitally through Microsoft Teams. 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.

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

Students needing an accommodation because of a disability or medical condition should communicate this need to Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities: https://www.ucalgary.ca/legal-services/university-policies-procedures/accommodation-students-disabilities-procedure

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).

Use of internet and electronic devices in class

Use of internet and electronic devices is essential for this course. Use of devices for purposes not related to the course will not be tolerated.

Guidelines for Teams Conferencing Sessions

Teams is a video conferencing program which will allow us to meet at specific times for a "live" video conference, so that we can have the opportunity to meet each other virtually and discuss relevant course topics as a learning community.

To help ensure Teams sessions are private, do not share Teams link or password with others, or on any social media platforms. Teams' links and passwords are only intended for students registered in the course. Teams' recordings and materials presented in Teams, 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 Teams, you play a role in helping create an effective, safe, and respectful learning environment.

Please be mindful of how your behavior 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 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.

If you are unable to attend a Teams 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 Teams 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 Teams 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 Teams 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)
Optional meetings may occur throughout the course to allow for face-to-face discussions and Q&A. These meetings will be recorded in Teams. Students can opt out or shut off their cameras & mics.

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
All recorded lectures or demonstrations will be done in YuJa, with the auto-captioning turned on. This will allow students to access the information using both visual and auditory modes.

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
The University of Calgary recognizes the pivotal role that student mental health plays 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
The University recognizes that 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

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.