



CIV E 789 B4 GIS Applications in Engineering Winter 2027 Syllabus

Time: Mondays, 2pm to 4:50pm **Location:** TBA

Instructor:

Sheika Henry, PhD

Office Location: 8-41, General Service Building

Sheika1@ualberta.ca

Office Hours: TBA

TA: TBA

COURSE DESCRIPTION

This course introduces students to the interdisciplinary application of Geographic Information Systems (GIS) in the sub-disciplines of natural resources management including forestry, environmental sciences, engineering, urban planning and earth science. The course is divided into two parts. The first part of the course covers the fundamentals of GIS, geodesy, projection, cartographic principles, spatial data, modeling tools and spatial analysis to solve real-world problems for the sustainable management of resources across sectors and industries. In the second part of the course, students will then apply their GIS skills by completing projects based on a predefined topic provided by the instructor or work on their own topic pertinent to their research, which aligns with the materials covered.

OBJECTIVE

To provide participants with the fundamental concepts of GIS and its application in various fields of study through the incorporation of a project-based learning approach to solving real-world scenarios.

LEARNING OUTCOMES

At the end of the course, students will be able to do the following:

- Understand fundamental GIS principles/concepts and tools.
- Explain the difference between raster and vector data models.
- Learn how to collect, process and integrate GIS data from multiple sources.
- Apply cartographic principles to visualize data and design maps for multiple use.
- Develop GIS skills that are required for conducting spatial analyses.
- Apply GIS/spatial analysis skills to solve real-world problems in a variety of fields.
- Apply project management principles to complete a GIS project.
- Communicate findings from GIS related projects to diverse audience that consists of technical and non-technical participants.
- Present final project result in a poster session on Campus.

COURSE FORMAT: This course has no exams and consists of lectures, exercises, class participation, group and an individual project.

TEXTBOOK: Course materials will be provided in the form of weblinks, pdfs, etc. via Canvas. Students are expected to read the course materials before attending class.

LEARNING PLATFORM: course materials will be provided via the Canvas learning platform.

SOFTWARE: Both commercial-based and open-source software (e.g. ArcGIS Pro, QGIS, Google Earth Engine, etc.) will be utilized in this course.

EVALUATION

ASSESSMENT METHOD	DESCRIPTION	WEIGHT	DUE DATE
Class Participation*	This includes active participation in discussions, class activities, completing assignments and, peer review of work plan, readings/seminar presentation. Lack of participation can result in a grade of zero (0) for this evaluation item. The participation grade is calculated as follows: (0): Not attended (1) Attended but not contributed, and (2) Attended and contributed.	10%	Throughout the term
Group Project & Presentation	Each participant will be assigned to a group and conduct a 10 minutes PowerPoint Presentation on the application of GIS in the sub-disciplines of natural resources management. The research should utilize peer-review academic journals. One member from each group should submit the project and the same grade will be assigned to each member unless where participants did not contribute to the project.	15%	February 8, 2027
Lab Exercises	Best 5 of 6 exercises will count towards your final grade.	20% (4% each)	7 days after the lab activity.
Individual Work Plan	This involves the development of an individual proposal in the form of a work plan based on the topic selected and the rubric provided. The Work plan should include preliminary results. Afterwards, class participants will be assigned to groups to conduct peer-review of the individual work plan.	20%	Work plan: February 22, 2027 Peer Review: March 01, 2027

Individual Project & Poster Presentation Session on Campus	This involves participants' individual completion of the final project in accordance with the work plan. Participants will be provided with a rubric and checklist for completion of the project to ensure that all requisite components are included in the final submission. Students are required to consult with the TAs and Instructor to ensure appropriate completion prior to submission of the final project. The project is to be presented as a poster. Consult the assignment document for the format.	35%	March 29th- April 5th, 2027 (Dates may be modified).
Total		100%	

*Excused absences will be considered to accommodate students who did not attend class due to illness/injury, severe domestic affliction, or other compelling reasons. These students should contact the instructor and provide the instructor with the appropriate documentation. Unacceptable reasons such as travel arrangements, vacation, and weddings will not be considered.

Assignments Information: Consult the assignment document for more information.

DUE DATES

Students must ensure that assignments are completed on time. Assignments should be submitted on the respective due dates mentioned above. **The labs should be submitted 7 days following the date the lab activity was issued.** There is a penalty for all late assignments of 10% for every 24 hours (or part thereof) that it is late (e.g., a "perfect" paper received ten days late would receive a zero) without approval. **All assignments are due at 11:00 p.m. Mountain Time on the due date or otherwise specified by the instructor. Only electronic submissions are accepted.**

COURSE SCHEDULE

Date	Period 1: Lecture	Period 2&3 - Lab / Exercise
Jan 4th	Course Introduction. Introduction to the concepts and application of GIS in the sub-disciplines of natural resources management including forestry, environmental sciences, engineering, urban planning and earth science, etc. Remote sensing principles and approaches.	Participation Exercise 1: Application of GIS in different fields of study.
Jan 11th	Spatial data models: vector and raster data and data formats. Spatial data collection and management in the sub-disciplines of natural resources management including forestry, environmental sciences, engineering, urban planning and earth science, etc. The use of GNSS, UAVs/drones, Field Maps, geospatial platforms, etc.	Participation Exercise 2: Collection and management of spatial data in various fields of study.
Jan 18th	Group Project Discussion	Lab 1: Mapping and visualizing GIS data using cartographic principles.

	GIS Application 1: Mapping, processing, manipulation, visualization and interpretation of spatial data collected. Datum, scale, coordinate systems, projection, georeferencing, cartographic principles and communicating GIS data.	
Jan 25th	Individual Project Discussion	Lab 2: Land Cover Analysis
	GIS Application 2: Land use / cover analysis using Geospatial Artificial Intelligence and traditional classification methods.	
Feb 1st	Guest Presentation: Collecting data using drones and application in the subdisciplines of natural resources management	Lab 3: Spatial Analysis - Site suitability assessment
	GIS application 3: Integrating spatial analysis and modeling techniques with GIS	
Feb 8th	Group Presentation	Lab 3 Cont'd: Site suitability assessment
	GIS application 4: Site suitability assessment	
Feb 15th	Statutory Holiday. University Closed. No Class	
Feb 22nd	Work Plan Deadline Peer Review Deadline February 26th	Lab 4: Environmental and health hazard analysis
	GIS application 5: Environmental and health hazards.	
Mar 1st	GIS application 6: Network Analysis	Lab 5: network analysis
Mar 8th	GIS application 6: Soil/water resources management	Lab 6: Soil/water resources management
Mar 15th	Individual project in class preparation	Individual project in class preparation
Mar 22nd	Individual project in class preparation	Individual project in class preparation
Mar 29th	Poster presentation on Campus	Individual project poster presentation during class session
April 5th	Course Wrap-Up	Review & Reflection

Note: the instructor reserves the right to modify the syllabus at any time based on the interest of the students and consultation. Any modification will be communicated with the students.

IMPORTANT DATES:

January 4 – Winter Term classes begin. Exceptions may apply; students must consult with their Faculty office.

February 15 – Statutory Provincial holiday; University buildings closed.

February 16 - February 19 - Winter Term Reading Week. Classes withdrawn for a full week

February 22: Classes begin for six-week courses offered in the second half of Winter Term

April 5: Last day of class. Exceptions may apply; students must consult with their Faculty office.

More information can be accessed here:

<https://calendar.ualberta.ca/content.php?catoid=44&navoid=13726>

Academic Integrity and Student Conduct

The University of Alberta is committed to the highest standards of academic integrity and honesty and maintaining a learning environment that fosters the safety, security, and inherent dignity of each community member, ensuring students conduct themselves accordingly. Students are expected to be familiar with the standards of academic honesty and appropriate student conduct and to uphold the policies of the University in this respect.

Students are particularly urged to familiarize themselves with the provisions of the Student Academic Integrity Policy and the Student Conduct Policy (online at <https://www.ualberta.ca/en/governance/resources/policies-standards-and-codes-of-conduct/code-of-student-behaviour.html>) and avoid any behaviour that could potentially result in suspicions of academic misconduct (e.g., cheating, plagiarism, misrepresentation of facts, and participation in an offence) and non-academic misconduct (e.g., discrimination, harassment, physical assault). Academic and non-academic misconduct are taken very seriously and can result in suspension or expulsion from the University. Please familiarize yourself with it and ensure that you do not participate in any inappropriate behavior as defined by the Code. Key components of the code include the following statements:

30.3.2(1) No Student shall submit the words, ideas, images or data of another person as the Student's own in any academic writing, essay, thesis, project, assignment, presentation or poster in a course or program of study.

30.3.2(2)c. No Student shall represent another's substantial editorial or compositional assistance on an assignment as the Student's own work."

Students should speak with the course instructor about any questions or concerns about the code. Students should be particularly aware of the code as it pertains to internet and library research, use of previous class notes, reclamation plans of former students and interviews or discussions with others.

All students must consult the Academic Integrity website to clarify academic offences. All forms of academic dishonesty are unacceptable at the University. Unfamiliarity with the rules, procrastination or personal pressures are unacceptable excuses for committing an offence. Listen to your instructor, be a good person, ask for help when needed, and do your work -- this will lead you toward a path to success. Any academic integrity concern in this course will be reported to the College of Natural and Applied Sciences. Suspected cases of non-academic misconduct will be reported to the Dean of Students. The College, the Faculty, and the Dean of Students are committed to student rights and responsibilities and adhere to due process and administrative fairness, as outlined in the Student Academic Integrity Policy and the Student Conduct Policy. Please refer to the policy websites for details on inappropriate behaviours and possible sanctions.

The College of Natural and Applied Sciences (CNAS) has created an Academic Integrity for CNAS Students Canvas site (<https://support.eclass.ualberta.ca/Knowledgebase/Article/View/583/54/accessing-canvas-courses>). Students can self-enroll and review the various resources provided, including the importance of academic integrity, examples of academic misconduct & possible sanctions, and the academic misconduct & appeal process. They can also complete assessments to test their knowledge and earn a completion certificate.

"Integrity is doing the right thing, even when no one is watching." -- C.S. Lewis

COPYRIGHT STATEMENT

"All original course materials prepared by the instructor are considered the instructor's intellectual property (unless otherwise noted) and are protected by law under Canada's Copyright Act. "Course materials" include slides, presentations, handouts, lecture notes, recorded lectures, and any other materials the course instructor distributed or made available to students. Permission is given for individual students to use these materials for their study purposes in this course. Students must not publish, post on a public Internet site, sell, rent, or distribute course materials without the instructor's permission."

Appropriate Collaboration

Students need to recognize when they've crossed the line between appropriate and inappropriate collaboration. If students are unsure, they must ask the instructors to clarify what's allowed and what's not. Here are some tips to avoid copying on assessments:

- a) Do not write down something you cannot explain to your instructor.
- b) When helping other students, avoid showing them your work directly. Instead, explain your solution verbally. Allowing your work to be copied is also considered inappropriate collaboration.
- c) Verbally discussing the solution in too much detail may result in written responses that are too similar. Try to keep discussions general or high-level.
- d) If you find yourself reading another student's solution, do not write anything down. Once you understand how to solve the problem, remove the other person's work from your sight and then write up the solution to the question yourself. Looking back and forth between someone else's paper and your paper is almost certainly copying and considered inappropriate collaboration.
- e) If the instructor or TA writes down part of a solution to help explain it to you or the class, you cannot copy it and hand it in for credit. Treat it the same way you would treat another student's work concerning copying. Remove the explanation from your sight and write up the solution yourself.
- f) There is often more than one way to solve a problem. Choose the method that makes the most sense to you rather than the method other students use. If none of the ideas in your solution are your own, there is a good chance it will be flagged as copying.

Contract Cheating and Misuse of University Academic Materials or Other Assets

Contract cheating is a form of academic dishonesty in which students get academic work completed on their behalf, which they then submit for academic credit as if they had created it themselves.

Contract cheating may or may not involve paying a fee to a third party, who then creates the work for the student.

Examples include:

- Getting someone to write an essay or research paper for you.
- Getting someone to complete your assignment or exam for you.
- Post an essay, assignment or exam question to a tutorial or study website; the question is answered by a "content expert," then you copy it and submit it as your own answer.
- Post your solutions to a tutorial/study website, public server or group chat and/or copying solutions posted to a tutorial/study website public server or group chat.

- Sharing your login credentials to the course management system (e.g. eClass, Canvas, etc.) and allowing someone else to complete your assignment or exam remotely.
- Using an artificial intelligence bot or text generator tool to complete your essay, research paper, assignment or exam solutions for you (without the instructor's permission).
- Using an online grammar checker to "fix" your essay, research paper, assignment or exam solutions for you (without the instructor's permission).

Contract cheating companies thrive on making students believe that they cannot succeed without their help; they attempt to convince students that cheating is the only way to succeed.

Uploading the instructor's teaching materials (e.g. course outlines, lecture slides, assignment or exam questions, etc.) to tutorial, study or note-sharing websites, public servers or chat apps is a copyright infringement and constitutes the misuse of University academic materials or other assets.

Receiving assignment solutions or answers to exam questions from an unauthorized source puts you at risk of receiving inaccurate information.

Policy about course outlines can be found in Course Requirements, Evaluation Procedures and Grading of the University Calendar.

Audio or video recording, digital or otherwise, of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as a part of an approved accommodation plan. Student or instructor content, digital or otherwise, created and/or used within the context of the course is to be used solely for personal study, and is not to be used or distributed for any other purpose without prior written consent from the content author(s).

Assessment-Specified AI-Use

In this course, we commit to Generative Artificial Intelligence (AI) use guided by ethical and transparent principles. While students are allowed to use advanced automated tools (such as ChatGPT or Dall-E 2) for certain written assignments, it is crucial to adhere to the following guidelines:

- Seek prior approval from the instructor for AI use in specific assignments.
- When allowed, clearly attribute and cite any AI-generated content in your work, including prompts and AI outputs as part of your academic record. Include an additional reflection component in your assessments, discussing how AI tools contributed to your learning process.

Important: Please note that AI use is strictly prohibited in assessments and assignments not approved by the instructor. Failure to abide by this guideline may be considered an act of cheating and a violation as outlined in the Student Academic Integrity Policy. In any event, any and all use of AI and AI tools in assessment tasks must be transparently and honestly identified and referenced as directed.

Accessibility and Accommodation:

In accordance with the University of Alberta's Discrimination, Harassment, and Duty to Accommodate Policy, the University of Alberta provides reasonable accommodations to eligible students who encounter medical or non-medical restrictions to their ability to perform the daily activities necessary to pursue studies at a post-secondary level. Medical restrictions include physical and mental health conditions (i.e., physical and mental disability, or medical, protected grounds); and, non-medical

restrictions include differential access or unfair treatment based on characteristics or perceived characteristics of an individual or group of individuals (i.e., non-medical protected grounds). Any student who wishes to request accommodations needs to complete an application, and provide supporting documentation that explains and verifies the basis of the application. Accommodation is a shared responsibility between the University and the individual in need of accommodation, and is assessed on the unique circumstances of each individual. If you have questions or require assistance, please email arrec@ualberta.ca. More information can be accessed here: <https://www.ualberta.ca/en/current-students/academic-success-centre/accessibility-resources/register/index.html>

Cell phone: Please refrain from using cell phones during lectures unless permission is given.