DALHOUSIE UNIVERSITY

Faculty of Science Course Syllabus
Department of Earth Sciences
ERTH3500 Geoscience Information Management (Summer 2021)

Instructor(s):	Dr. Christopher Greene (csgreene@dal.ca)
Teaching Assistant:	Beau Ahrens (BeauAhrens@dal.ca)
Marker / Demonstrator	Leah Fulton (Leah.Fulton@dal.ca)
Lectures:	Asynchronous with 4-6 narrated lectures per module (1 module = 1 weeks).
Tutorials:	Synchronous Q&A Session, Thursdays from 9:35 to 10:55 AM
Laboratories:	Asynchronous with approximately 1-2 exercises per module.
Live Help (With TA):	Three by-appointment sessions per week, 20-min slots (M, W, TH)
Live Office Hours:	Two by-appointment sessions per week, 20-min slots (TU, F)

All times listed are in the Atlantic Time Zone. Scheduling of Office Hours and Help Sessions may be modified to improve effectiveness if there the Teaching Team identifies conflicts or low demand early in the semester.

Course Description

Geographic Information Systems (GIS), as a tool for the management of georeferenced data, have become indispensable for disciplines where location of objects and pattern of processes is important. GIS plays a fundamental role for a wide range of applications, from modeling, to analysis and predictions, to decision making. The course is designed for a broad base of potential users and draws on examples of the role of GIS in global climate change, mineral exploration, preservation of biodiversity, coastal zone management, resource depletion, and many other present and future environmental issues. The course material will be of interest to those studying geoscience, environmental science, ecology, marine biology, oceanography, epidemiology, urban and rural planning, civil engineering, and any other field involving spatial data. Laboratory exercises emphasize the principles of raster and vector GIS, and the integration of databases and GPS (global positioning systems) data into GIS. Exercises draw on the diversity of GIS applications in a number of topical areas.

Course Prerequisites

PREREQUISITES: Two years of university study or equivalent or instructor's permission

CROSS-LISTING: ERTH 5600, GEOG 3500, ENVS 3500

Course Exclusion

EXCLUSIONS: Credit will only be given for one of ERTH 3500.03, ERTH 5600.03, GEOG 3500.03, SCIE 3600.03 or ENVS 3500.03

Learning Objectives

With successful completion of the course, students will be able to:

- recognize and describe how geographic information science governs (or should govern) the use of geographic information systems;
- recognize and describe the components (and component functions) of geographic information systems
- explain and demonstrate how geographic data is generated, managed, modified, visualized;
- critique the quality of geovisualization from a range of sources (popular media, memes, peer-reviewed manuscripts);
- conduct basic, non-inferential spatial analysis using GIS software; and
- compare / contrast how geographic information systems can be used to aid decision-making across several disciplines.

Course Materials

Recommended Textbook:

Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2015). *Geographic Information Science and Systems* (4th ed.). Wiley Publishing.

Software:

Access to ArcGIS Pro™ 2.7 is required. Two access methods are provided in this class: **1) available to download** through the Dalhousie Software resources to run on a Windows Operating System, or **2) through a strong, stable broadband connection in a virtual lab environment**. Students are responsible for ensuring they have either an appropriate Windows capable machine at home and / or a stable broadband internet connection.

Narrated lectures, assignment instructions, data delivery, assignment submission, important course announcements are delivered through the **Brightspace Learning Management System (LMS)**.

Group drop-in live help sessions and drop-in office hours will be delivered through **Collaborate Ultra** (within the Brightspace Learning Management System). One on one help by appointment will be delivered through **Microsoft Teams** (outside of the Learning Management System).

The **Respondus Lockdown Browser** may be required for some online testing scenarios. This browser can be obtained through the Dalhousie software downloads page for Windows or Mac Operating Systems.

Course Assessment

Category	Component	Weight (% of Final Grade)	Category Weight	Date
Theory	Module Assessments	6	54	End of Each module (start of following week)
	Test 1 [1]	14		July 19th, 2021
	Test 2 [1]	14		August 9th, 2021
	Final Exam [1]	20		August 23rd, 2021
Applied	Workshop Deliverables	12	46	Workshop A – Thursdays Workshop B - Mondays
	Lab Project 1	17		July 29th, 2021 @8:00 pm
	Lab Project 2	17		August 19th, 2021 @8:00 pm
Total			100	

[1] Tests and exams will be delivered as take-home tests. Theses assessments have an open window of availability. Once initiated students have to finish within the time limit for the assessment (90 minutes for tests, 3 hours for final exam).

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

Grade	Range	Definition and Expectations
A+ A A-	90-100 85-89 80-84	**Excellent:** Considerable evidence of original thinking; demonstrated outstanding capacity to analyze and synthesize; outstanding grasp of subject matter; evidence of extensive knowledge base.
B+ B B-	77-79 73-76 70-72	**Good:** Evidence of grasp of subject matter, some evidence of critical capacity and analytical ability; reasonable understanding of relevant issues; evidence of familiarity with the literature.
C+ C C-	65-69 60-64 55-59	**Satisfactory:** Evidence of some understanding of the subject matter; ability to develop solutions to simple problems; benefitting from his/her university experience.
D	50-54	**Marginal Pass:** Evidence of minimally acceptable familiarity with subject matter, critical and analytical skills (except in programs where a minimum grade of 'C' is required).
F	<50	**Inadequate:** Insufficient evidence of understanding of the subject matter; weakness in critical and analytical skills; limited or irrelevant use of the literature.

Course Policies

Course Completion

To successfully complete the course, **students must receive 50% of the total possible points or higher for both the theoretical and applied portions of the course.** Not meeting this minimum threshold will result in a grade of F for the course, even if an overall score of 50% or greater is achieved.

Communications

Students are required to use discussion boards in the Learning Management System for a large proportion of communications, especially if related to course management and assessments that have applicability to the class. If the Instructor or Teaching Assistants receive an email and feel the question should go to the discussion boards, they will ask the student to replicate their question there for a full response.

Discussion boards will be set to allow anonymous posting to increase the comfort level of students posting publicly. Please note that even with anonymous posting the moderator (i.e., the instructor or teaching assistant) will know the identity of the user posting. Please endeavour to be courteous in all communications, including discussion boards.

Due to the volume of emails received during the semester, I am unable to guarantee immediate responses to email enquiries. Typically, students should expect an average of one business day for turnaround of responses to emailed questions.

Course Variations

The course will be taught as close to the listed schedule as possible, however some deviation from this schedule may be required as the term progresses. Content in the coarse schedule below are broad descriptors and do not provide the number or name of individual lectures as these are being edited as the course progresses.

Learning Management System (LMS)

Important information is posted to the LMS daily. It is the responsibility of each student to check the LMS and their Dalhousie email on a regular basis to ensure they are not missing any important materials, updates, announcements, etc.

Materials posted to the Learning Management System are for personal use only and are not to be shared (see Copyright Disclaimer in the LMS Course Shell). Sharing class materials with other students (registered in the class, not in the class, or outside the institution) is not permitted. Posting class materials to course sharing sites is also not permitted and could be considered both a copyright issue as well as a breach of academic integrity

Student Absence Declaration

This course has opted into the student declaration of absence in lieu of sick notes. Please refer to https://bit.ly/2NJS8jw for specific details about the use of the Student Declaration of Absence. This mechanism is meant to substitute for sick notes from a doctor related to short absences (less than three days) and does not provide an automatic exemption from any missed assessments. Accommodating the absence whether be exemption or makeup assessment is at the discretion of the course instructor. The SDA process can only be used twice in the course.

Missed Small Deliverables (Module-Related Exercises and Structured Workshops)

For both the module related exercises and the structured workshops, the lowest individual item for each will be dropped from the total score. If a student does not submit an item, that item is assigned a 0 and will count as the lowest score item.

Missed Tests & Exams

If accommodations are granted for a missed tests or final exam, one of the following options will be provided after consultation (to inform instructor decision) with the student:

a. A make-up test or exam offered on another date
b. An alternate assignment that can be completed in lieu of the exam
c. A re-weighting of assessment components that applies to students who miss the final

Submission of Work

To reduce the carbon footprint related to class delivery, most work will be submitted and graded electronically in the Brightspace LMS to reduce paper use. All written work will be subject to evaluation using a plagiarism detection service (see Academic Integrity Policy for further detail).

Late penalties for written work without accommodation from the instructor are -20% per calendar day. Late penalties begin to accrue after the time of day deadline has been reached. For example, if an assignment is due on September 4th at 12:00 pm, submissions past that time (plus a brief "grace period") are subject to the first application of a -20% late penalty.

All students are responsible for ensuring the product they submit to the LMS is the one they intended to submit. There has been an emerging trend of "I submitted the wrong draft" as a justification for high similarity in originality detection, or as an effort to buy time to avoid late penalties from submitting after the scheduled due date. If a resubmission is permitted, that submission will be subject to a grade penalty unless there is timely notification from the student to the instructor that the wrong draft was submitted.

Unless otherwise noted by the instructor, independent work is required for each student. General discussion and peer tutoring are acceptable and encouraged; however, assessments with highly similar structure and flow of ideas is not acceptable and could be submitted to the faculty academic integrity officer for review.

Topic List

Module	Lecture	Reference
1	1-1: Geographic? Spatial? Geospatial?	Longley et al Ch. 1 pp. 1-9
	1-2: Geographic Information Science? Or Systems	Longley et al Ch. 1 pp. 3-32
	1-3: A Primer on Map Making	Longley et al Ch. 11 pp. 237-265
	1-4: Geographic Views and Spatial Objects	Longley et al Ch. 3 pp. 55-66
	1-5: Data Models Representing Spatial Objects	Longley et al Ch. 3 pp. 66-69
	1-6: Binary and Levels of Measurement	-
2	2-1: Assigning Coordinates to Locations	Longley et al Ch. 4 pp. 77-86
	2-2: From Measurement to Map	Longley et al Ch. 4 pp. 86-98
	2-3: Adding Location to Unreferenced Data	-
	2-4: Uncertainty & Error – Conception of Phenomena	Longley et al Ch. 5 pp. 99-111
	2-5: Uncertainty & Error – Representation of Phenomena	Longley et al Ch. 5 pp. 111-117
	2-6: Uncertainty & Error – Analysis of Phenomena	Longley et al Ch. 5 pp. 117-126
3	3-1: Governing Concepts in Understanding Geographic Phenomena	Longley et al Ch. 2 pp. 33-54
	3-2: Classification and Choropleth Mapping	Longley et al Ch. 11 pp. 248-253
	3-3: More on Counts and Zones in Choropleth Mapping	Buckley (2013)
	3-4: Geovisualization – Other Ways to Consider Spatial Data	Longley et al Ch. 12 pp. 266-280
4	4-1: Databases I – an Overview of Types and Terms	Longley et al Ch. 9 pp. 194-200
	4-2: Databases II – Normalization vs. Table Join	-
	4-3: Database III – SQL, Boolean Terms, Select by Attributes	Longley et al Ch. 9 pp. 202-202
	4-4: Databases IV – Adding Geographic Functions	Longley et al Ch. 9 pp. 202-206
	4-5: Databases V – Structuring Geographic Data	Longley et al Ch. 9 pp. 206-212
5	5-1: Spatial Analysis – An Introduction to Spatial Analysis	Longley et al Ch. 13 pp. 290-294
	5-2: Spatial Analysis – Analysis by Location	Longley et al Ch. 13 pp. 295-303
	5-3: Spatial Analysis – Analysis by Distance	Longley et al Ch. 13 pp. 303-317
	5-4: Spatial Analysis – Vector Overlay	Jensen Ch. 6
	5-5: Spatial Analysis – Raster Overlay	Jensen Ch. 6
	5-6: Spatial Analysis – Raster Operations	Jensen Ch. 6
6	6-1: Remote Sensing – Electromagnetic Radiation	-
	6-2: Remote Sensing – How Data is Stored	-
	6-3: Remote Sensing – Resolution(s)	-
	6-4: GNSS – The Three Segments	Shelito Ch. 4
	6-5: GNSS – Estimating Locations	Shelito Ch. 4
	6-6: GNSS – Sources of Positional Error	Shelito Ch. 4
7	7-1: Models – Differentiating Data Models and Spatial Models	Longley et al Ch. 15 pp. 339-351
	7-2: Models – Accuracy and Validity in Spatial Models	Longley et al Ch. 15 pp. 354-356

**The timing of these topics is approximate. Some shifting of topics will occur depending on total timing of narrated lectures. Names of narrated lectures will be longer and more refined than provided in this coarse overview. **

Course Schedule

Week	Start	End	Module	SWS-A	SWS-B	Major Assessment
1	05-Jul-21	11-Jul-21	1	SWS-0	SWS-1	-
2	12-Jul-21	18-Jul-21	2	SWS-2	SWS-3	-
3	19-Jul-21	25-Jul-21	3	Working	Working	**Term Test 1**
4	26-Jul-21	01-Aug-21	4	Working	SWS-4	**Lab Project 1**
5	02-Aug-21	08-Aug-21	5	SWS-5	SWS-6	**-**
6	09-Aug-21	15-Aug-21	6	Working	Working	**Term Test 2**
7	16-Aug-21	22-Aug-21	7	Working	SWS-7	**Lab Project 2**
8	23-Aug-21	29-Aug-21	-	-	-	**Final Exam**

Faculty of Science Course Syllabus (Section B)

University Policies and Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

Information: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

Information: https://www.dal.ca/campus_life/academic-support/accessibility.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.

Code: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness

Statement: http://www.dal.ca/cultureofrespect.html

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) (elders@dal.ca).

Information: https://www.dal.ca/campus_life/communities/indigenous.html

Important Dates in the Academic Year (including add/drop dates)

https://www.dal.ca/academics/important_dates.html

University Grading Practices

https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Student Resources and Support

Advising

General Advising https://www.dal.ca/campus_life/academic-support/advising.html

Science Program Advisors: https://www.dal.ca/faculty/science/current-students/academic-advising.html

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Black Students Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre/current-students.html

Academic supports

Library: https://libraries.dal.ca/

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Studying for Success: https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Copyright Office: https://libraries.dal.ca/services/copyright-office.html

Fair Dealing Guidelines https://libraries.dal.ca/services/copyright-office/fair-dealing.html

Other supports and services

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness/services-support/student-health-and-wellness.html

Student Advocacy: https://dsu.ca/dsas

Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Safety

Biosafety: https://www.dal.ca/dept/safety/programs-services/biosafety.html

Chemical Safety: https://www.dal.ca/dept/safety/programs-services/chemical-safety.html

Radiation Safety: https://www.dal.ca/dept/safety/programs-services/radiation-safety.html

Scent-Free Program: https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html

Dalhousie COVID-19 information and updates: https://www.dal.ca/covid-19-information-and-updates.html