DALHOUSIE UNIVERSITY

Faculty of Science Course Syllabus
Department of Earth and Environmental Sciences

ENVS 3100 Environmental Analytics
Winter Term 2023

Instructor: Dr. Amy Mui (amy.mui@dal.ca)
Office Hours: Click HERE to make a virtual booking with me
Course TA: Riley Scanlan (riley.scanlan@dal.ca)

	DAY	TIME	LOCATION
Lectures:	Tues	11:35-12:55pm AST	LSC B2055
Labs	Wed	1:05-2:25pm AST	MCCAIN 2019

Course Description:

This course provides students with the opportunity to apply foundational knowledge of statistics and data analysis to support environmental decision-making and communication of results. Lab sessions provide hands-on experience with spatial pattern determination, spatial interpolation, raster analysis, and the use of ecological modelling algorithms. Emphasis is placed on learning skills directly applicable to conducting environmental research in a variety of settings. Analysis and interpretation of data is conducted across multiple software environments and packages (e.g., R, ArcGIS, Linkage Mapper) and includes advanced methods of visualizing spatial, multi-dimensional (2D/3D), and non-static information.

Prerequisites: ENVS2100, STAT2080

Objectives / Learning Outcomes:
Students will;

- Strengthen their understanding of the conceptual foundations of environmental statistics and the major issues and pitfalls associated with study design and the use of computer models.
- Learn to recognize and apply appropriate analytical techniques to different types of environmental data
- Interpret results of analytical methods and apply science-based conclusions
- Gain experiencing utilizing a variety of visualization methods for depicting complex environmental data

Course Format & Materials

Online Platforms | A combination of web-based platforms will be used to share materials and facilitate a community of support.

- **BRIGHTSPACE**: All assignment instructions, grades, and primary announcements will be posted here. Ensure your settings send you an email when announcements are made. This will be my primary method of communication.

- **MS TEAMS**: Online classes (if any) will be held here. Any questions relevant to the entire class should be posted here as well using the chat board. If you do not see the class in your MS Teams page, please email your TA and ask to be manually added.
- **PADLET**: This will be used to build community, solicit participation, and give a relief from the rigours of data analytics!

I am open to suggestions along the way. If you have any ideas to make this term better for everyone, please do not hesitate to reach out to me

Course Materials & Computer Access:
There is no textbook for this course. Reading materials will be provided through Brightspace or links in the course slides. We will be using R (RStudio), Excel, and a GIS (Arc +/- Google Earth) in class. A windows computer is highly recommended for ArcGIS Pro though remote and virtual platforms are available or Mac users.

Course Assessment

Component	Weight	Date
Group exercises	40%	Ongoing (during lab time)
Concept Checks x 3 (5% each)	15%	(in-class)
Presentation-Debates	15%	(in-class)
Participation-Engagement	10%	Throughout term
Final Exam	20%	(during final exam period)

1. **In-class Group Exercises.** Students complete small tasks related to weekly topics in pairs or small groups to build proficiency in applied skills (e.g., data analysis and data visualization). The purpose is to repeat tasks until they become familiar. Outcomes are submitted individually before the end of the day (with some flexibility). ~1 hour of class time. ** Student may elect to work alone but forfeit the 2% participation grade associated with group work **
2. **Concept Checks.** Short questions based on broader concepts will assess your understanding of the class topics. Concept checks are written online via Brightspace and spread out throughout the term (4-5 total). They are written during class time and should take approx. 10-15min to complete.
3. **Science Literacy & Communication:** This module is in development and will be discussed in class at the start of the term. The format will be as a presentation or debate.
4. **Participation-Engagement:** Assessed through weekly padlet prompts on various topics (8%) as well as your contribution to teamwork and peer support (2%). TWO peer support polls will be given out during the term worth 1% each. This is to recognize students who take initiative to start discussions, provide support, and lead or moderate peers during breakout groups and contributes to development of important soft skills.

5. **Exam.** A final applied exam will be written during the exam period. The test is cumulative and involves applied skills. If you completed all the in-class exercises, the final exam should hold no surprises.

MISSED CLASS. If you miss a class you are responsible for catching up on missed materials. Aside from reviewing slides and lab instructions, you should also contact a classmate to make sure you are aware of all the information that was missed. Extra incentive to make a buddy!

MISSED WORK. Students must submit an email to me **prior to** missing a deadline and I will respond with next steps.

Course Schedule

WEEK	TOPIC	CLASS	LAB	Assessment
1 Jan10	WELCOME to 3100!	Poll, Icebreaker, short activity	NO LAB	
2 Jan17	Data Skills: Summarising & Finding Trends	UN SDG Exercise	Data Extraction in Excel	
3 Jan24	Data Skills: Building Spreadsheet Proficiency	Useful tools and formulas	Data Manipulation in Excel	
4 Jan31	Data Mining: Correlation	Case Study: Plight of the Pika	Correlation Analysis in Excel and R	
5 Feb7	Data Mining: Regression	Case Study: Plight of the Pika (cont'd)	Regression Analysis in Excel and R	
6 Feb14	DataViz: Graph Interpretation	Graphing Literacy & ggplot Intro	Practice graph interpretation exercises	Concept Check 1
7 Feb21	**Winter Study Break (no meetups, no class)**			
8 Feb28	Data Viz: Building Better Graphs	Creating animated graphs	Create ggplots from sample data	
9 Mar7	GeoSpatial Problem Solving	Demonstrate coding script for gganimate (animated graphs)	GIS-based practice exercises	Concept Check 2
10 Mar14	GeoSpatial Problem Solving	Case Study: Parks & PA Planning	GIS-based practice exercises	
11 Mar21	Science Communication & Dissemination	Effective Argument	Overflow: Time to work on presentations	Concept Check 3
12 Mar28	Presentations WEEK	Student Presentations	Student Presentations	
13 Apr4	Course Review	Concept Review	Applied review	
Final Exam Scheduled during exam period				

**In-Class exercises are discussed as a group but submitted individually and graded. If you miss a class, you may still complete the exercise on your own.*

IMPORTANT NOTES:

- Attendance is a requirement and expectation for success in this course.
- This schedule is tentative and may change slightly depending on class interests and time available. The syllabus will be updated accordingly and posted on Brightspace.
- All course materials will be posted on Brightspace - please login to the site regularly.
- Important dates such as the last day to drop courses can be viewed here: https://www.dal.ca/academics/important_dates.html
- Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale:

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (<50)
A- (80-84)	B- (70-72)	C- (55-59)	

Course Policies

***Class culture*:** Living with COVID-19 has hopefully taught us all to be adaptable and optimistic in the face of uncertainty. Building a class community and having peers to support you will make this journey more enjoyable and successful. Turn on your videos during online class, talk to your peers during group exercises, and engage with me and your TA. A demonstration of mutual respect, inclusiveness, and curiosity is expected. Attend all class, arrive on time, and ask questions!

***Missed classes*:** All of the information related to the logistical and administrative components of this course will be communicated in the lectures and labs. If you miss any, it is your responsibility to make contact with a fellow student and catch up on what you missed, regardless of whether the absence was justified or not.

Late penalties: Assignments handed in on the due date will be evaluated at 100% of their potential score. Late assignments will be subject to a late penalty of 20% per day (including weekends). Assignments submitted five calendar days past the due date will be assigned a zero. Assignments handed in AFTER the work has been returned to the class cannot be marked for credit.

***Documentation**:* Documentation is required to substantiate illness and emergency. In the case of illness a doctor's note is required. In the case of other emergencies please speak with Dr. Sue Gass (susan.gass@dal.ca or 902-494-4530) or Dr. Amy Mui (amy.mui@dal.ca or 902-494-4197) about appropriate documentation (for example, a funeral program in the case of a death in the family). All documentation MUST be submitted to Dawn Hall in the Environmental Science main office.

Plagiarism: Plagiarism and cheating is a serious academic offense and includes the submission or presentation of the work of another as if it were one's own. Failure to acknowledge someone else's words, phrases, ideas, recording, images, code, results, lecture content, term paper, or assignment responses may result in a failing grade or, if very serious, suspension or expulsion from the university. Please visit https://www.dal.ca/dept/university_secretariat/academic-integrity/plagiarism-cheating.html for more information.

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 (add/drop): 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 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

Research Lab Safety:
https://www.dal.ca/content/dam/dalhousie/pdf/dept/safety/lab_policy_manual_2007.pdf
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