ENVS 3100 Environmental Analytics
Winter Term 2019

Instructor: Amy Mui
amy.mui@dal.ca
Life Sciences Centre 813
902-494-4197 (office)

Lectures: Wednesdays 11:35-12:55
Location: LSC B2055

Labs: Mondays 11:35-1:55
Location: DUNN 301A computer lab

Course Description:
This course provides students with the opportunity to apply foundational knowledge of statistics and data analysis to support environmental conservation and sound decision making. Lab sessions provide hands-on experience with power, effect, and sample size analysis, 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 Materials:
There is no textbook for this course. Reading materials will be provided through Brightspace or links in the course slides.

Web-based Student Response System
We will be using a free student response system called Socrative (www.socrative.com) or PollEV (www.pollev.com) which can be accessed online or downloaded as an app (Socrative Student) for your mobile devices. This tool will be used to review past material, and query the class on various topics of interest. Please ensure you bring your device (smartphone, tablet, laptop) to lectures to participate.
Course Assessment

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Exercises (12% each)</td>
<td>36%</td>
<td>Throughout term</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>15%</td>
<td>11 February (in-class)</td>
</tr>
<tr>
<td>Debate / Poster / Presentation</td>
<td>10%</td>
<td>25/27 March (in-class)</td>
</tr>
<tr>
<td>In-class exercises</td>
<td>14%</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Final Exam</td>
<td>25%</td>
<td>April (exam period, 10-26th)</td>
</tr>
</tbody>
</table>

1. **Lab Exercises.** Students complete tasks pertaining to each major lecture topic using an environmental dataset. In most cases, we will have worked together as a class to complete a simplified version of the analysis, and students are provided with new data on which to complete a similar task. This serves to reinforce the lecture materials, and to practice newly acquired analytical skills.

2. **Debate / Poster / Presentation.** As a class we will discuss what format is preferred for an independent project utilizing open environmental data. Results will be presented in class.

3. **In-class Exercises.** In-class activities and small group work are used to help students engage with the material and achieve deeper learning. Students complete a series of problem sets throughout the term and may drop the lowest mark if all are completed.

4. **Exams.** The midterm and final exams are computer-based and test both your conceptual understanding of course topics and technical skills.

**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 class mate to make sure you are aware of all the information that was missed.

**MISSED LAB.** Ample (2.5h) lab time is scheduled to ensure you have sufficient support to complete the tasks required. **If you miss a lab session, you are expected to catch-up by the following scheduled lab time** to ensure the class can move forward together. Additional support outside of lab time is provided when appropriate. Extended support prior to deadlines, and when excessive labs have been missed, will not be provided.

**MISSED WORK.** Students must submit an email to me prior to missing a deadline, along with an SDA (Student Declaration of Absence) via Brightspace. Extensions are not granted automatically. The email must be sent to me PRIOR to the deadline, and I will respond with next steps.
## Course Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>LAB (DUNN301A) – 2.5h</th>
<th>CLASS (LSC B2055) 1.5h</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 7</td>
<td>Introductions. What is Analytics? Class Survey. First Exercise.</td>
<td>9 Excel tips and tricks Intro to R</td>
</tr>
<tr>
<td>2</td>
<td>Jan 14</td>
<td>Correlation Analysis in Excel and R</td>
<td>16 Regression Analysis in Excel and R LAB 1 Overview</td>
</tr>
<tr>
<td>3</td>
<td>Jan 21</td>
<td>Climate Change - Evidence LAB 1: Work Session</td>
<td>23 Climate Change – Evidence</td>
</tr>
<tr>
<td>4</td>
<td>Feb 28</td>
<td>LAB 1: Work Session</td>
<td>30 Dane George, Guest Workshop: Energy Audit LAB 1 due: Feb 3 end of day 11:59pm</td>
</tr>
<tr>
<td>5</td>
<td>Feb 4</td>
<td>Midterm (1.5h)</td>
<td>6 CASE STUDY</td>
</tr>
<tr>
<td>6</td>
<td>Feb 11</td>
<td>LAB 2: Lab Work Session • Manual Digitization</td>
<td>13 Debate / Poster / Presentation Discussion Graphing resource change data (Lab 2)</td>
</tr>
<tr>
<td>7</td>
<td>Mar 18</td>
<td>Winter Study Break (no lab)</td>
<td>20 Winter Study Break (no class)</td>
</tr>
<tr>
<td>8</td>
<td>Mar 25</td>
<td>Debate / Posters / Presentations</td>
<td>27 Debate / Posters / Presentations (overflow time)</td>
</tr>
<tr>
<td>9</td>
<td>Mar 4</td>
<td>LAB 2: Work Session • Animating time series imagery</td>
<td>7 Great Migrations video Lab 2 due: March 10 end of day</td>
</tr>
<tr>
<td>10</td>
<td>Mar 11</td>
<td>LAB 3: Biodiversity Management • Critical Habitat Mapping</td>
<td>14 CASE STUDY</td>
</tr>
<tr>
<td>11</td>
<td>Mar 18</td>
<td>LAB 3: Work Session • LCP Mapping</td>
<td>21 Guest Workshop: Biodiversity Mapping</td>
</tr>
<tr>
<td>12</td>
<td>Mar 25</td>
<td>LAB 3: Work Session • MoveVis Animation in R</td>
<td>28 Coding in R, cont’d</td>
</tr>
<tr>
<td>13</td>
<td>Apr 1</td>
<td>LAB 3: Final Work Session</td>
<td>4 Review Session Lab 3 due: Apr 7 end of day</td>
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</tbody>
</table>

**End** | Final Exam scheduled during exam period (April 10-26th)

### 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:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Numerical</th>
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<th>Grade</th>
<th>Numerical</th>
<th>Grade</th>
<th>Numerical</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>90-100</td>
<td>B+</td>
<td>77-79</td>
<td>C+</td>
<td>65-69</td>
<td>D</td>
<td>50-54</td>
</tr>
<tr>
<td>A</td>
<td>85-89</td>
<td>B</td>
<td>73-76</td>
<td>C</td>
<td>60-64</td>
<td>F</td>
<td>&lt;50</td>
</tr>
<tr>
<td>A-</td>
<td>80-84</td>
<td>B-</td>
<td>70-72</td>
<td>C-</td>
<td>55-59</td>
<td></td>
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</tbody>
</table>
Course Policies

**Class culture:** We aim to cultivate a culture of mutual respect, inclusiveness, and collective curiosity. Students should arrive to class on time and not engage with materials that are outside of the course. Be courteous of your neighbours and use class time to focus on course materials to ensure your success.

**Missed classes:** All of the information related to the logistical and administrative components of this course will be communicated in the lectures. If you miss any part of a lecture, 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](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](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.


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:
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

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