## Department of Biology

# BIOL /ENVS / GEOG / MARI 3633.03

# Spatial Information and GIS in Ecology: A Practical Introduction

## Summer 2022

## June 17-30

***Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people***.

**Instructor:** Dr. Peter Bush petergbush@yahoo.ca

**TA:**

**Lectures**: 8:35 – 12:00 Elizabeth May Lab (To Be Confirmed) in Life Sciences Building Earth Science/Biology Wing

**Laboratories**: 12:30 – 4:00 Elizabeth May Lab (To Be Confirmed) in Life Sciences Building Earth Science/Biology Wing

**Field trips**: June 23 – 26 Overnight trip to Harrison Lewis Centre (See Schedule

**Course Delivery:** in-person

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**Course Description**

A hands-on approach to understanding and using spatial information, this course introduces students to Geographic Information Systems (GIS) as a tool to answer ecological questions. Together, students conduct a major field project, collecting data, creating maps using GIS, and interpreting spatial patterns, to address an applied problem in ecology.

NOTES: Offered in the summer through **SEASIDE**. An auxiliary fee is charged to cover field expenses. For dates, times and special registration procedures, see seaside.science.dal.ca.

**Course Prerequisites**

BIOL 2060 (Intro to Ecology)

**Overview**

This class offers a hands-on introduction to many basic spatial topics including GIS, GPS and Cartography, and uses Geographic Information Systems (GIS) to teach most of these topics. It introduces students to GIS – What is it? What types of problems can it solve? Throughout the class, students are shown the basics of spatial data and some of the most commonly used tools in GIS. Following one week in the classroom, students spend a week at field station where they have the opportunity to use the recently taught GIS skills to work on projects and solve problems. A number of projects will be offered for students to choose. The variety of projects will illustrate how GIS can be utilized as a tool for problem solving within a project rather than as the project itself. This course will show how GIS can be used as a tool in ecology. Students will be expected to bring together their newly acquired GIS skills with their own prior knowledge in ecology.

**Course Objectives/Learning Outcomes**

- Students will understand how GIS data and projects are organized
- Students understand the basics of GIS formats, particularly the ones that are native to ArcGIS
- Students will learn basics of map projections, and some of the advantages and disadvantages of the main classification types
- Students will learn about datums/projections and how they can be changed
- Students will learn how GPSs work as well as some limitations of them.
- Students will learn how to create their own geographic data
- Learn the difference between the 2 main data models used in GIS and their advantages/disadvantages
- Students will learn many basic tools of GIS while gaining the confidence to explore new tools on their own
- Students will learn how to apply the practical ecology and GIS skills in other courses and apply it to an independent group project
- Learn cartographic skills to help make useful maps.

**Course Materials**

- There is no text book for the class. All material will be supplied through the course website as either powerpoint or PDF files.

**Course Assessment**

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|---|---|
| Quiz – Theory (lecture material) June 24th | 17% |
| Quiz – Hands on techniques June 28th | 18% |
| Assignments | 25% |
| *Assignment 1 (5%)* | |
| *Assignment 2 (7%)* | |
| *Assignment 3 (13%)* | |
| Final Project | |
| Project and Presentation | 40% |

** All assessment is to be done individually unless marked otherwise.
** Late assignments will be docked at 5%/hr late

**Other course requirements**

All students will require a memory stick (USB stick, jump drive) with 8 Gig of free space to be used for this course. **Students will require a PC (running windows) that can load and run ArcGIS for the field portion of the class**. All material will be made available through the Online Learning Environment (Brightspace). Additional readings will be available online. Students will also be required to supply a field book for notes.

**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*: We aim to cultivate a culture of mutual respect and collective curiosity. We ask that all students arrive to class on time, turn off their cell phones, and do not engage with materials that are outside of the course during class time. Please also be courteous of your neighbours by not distracting them during class time.

*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*: ** Late assignments will be docked at 5%/hr late

*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 your department academic advisor about appropriate documentation (for example, a funeral program in the case of a death in the family). All documentation MUST be shared with the course instructor.

## Course Schedule

**Day 0 – Software and Hardware**

- Getting required software installed and configured
- Navigating the course page
- *To be completed before you begin the first day's lecture component*

**Day 1 – Friday, June 17**

**Morning**

Course Expectations
Intro to GIS

**Afternoon**

GIS Data
- How is it collected?
- Show examples for NS
- Show examples for World

Introduction to basic map making
Introduction to projects options

**Day 2 – Saturday, June 18**

**Morning**

File management and spatial data formats
Projections and Datums

**Afternoon**

Commonly used Vector tools
Attribute Selection
Introduce Assignment #1

**Day 3 – Sunday June 19**

**No Class**

**Day 4 Monday June 20–**

- How a GPS works
- Hands on project (geocaching)
    - Defining projection/datum
    - Saving points and lines
- Adding GPS data into a GIS

**Afternoon**

Creating data

- How to add points, lines, and polygons by tracing in from a georeferenced image
- How to add points, lines, and polygons using coordinates
- How to add points from a table
- Setting snapping
- Editing data
- How to change the attributes of a feature
- How to change the shape/location of a feature
- Adding fields
- Calculating Area of polygons

**Day 5 –Tuesday June 21**

**Morning**

Introduce more Vector Tools

- Erase
- Dissolve
- Merge
- Union
- Intersect
- Create Random Points

Review

**Afternoon**

GIS Data Models

- Comparison between Vector Model and Raster Model
    - Define the 2 models
    - Tips on when to use which
    - Advantages/Disadvantages to each
    - How to identify which model is being used

Other Topics…

- Metadata
  - Why it is important
  - How to add it
- Hyerlinking
- Other useful software

Work on Assignments or Major Project

**Day 6 – Wednesday June 22**

**Morning**

Theory Quiz

Introducing Raster Data
Commonly Used Tools for Raster

**Afternoon**

More commonly used Tools for Raster
Georeferencing

**Day 7 – Day 11 Thursday June 23 through Monday June 27)**

Meet at Dal at 10:00 AM on Thursday; drive to Harrison Lewis Centre, Sandy Bay Landings, Port Joli area. See list of personal items below that you need to bring

**Day 12 – Tuesday, June 28**

**Morning**

Hands-on Quiz

**Afternoon**

Cartography

**Days 13 – Wednesday June 29**

Work on final project and assignment

**Day 14 – Wednesday, June 30**

Presentation/Submission of Final Projects
(Students will each present their final project through a Powerpoint Poster and zoom lightening presentation)

**What to bring on field trips**

- Snacks & special treats for yourself
- Field notebook
- Class handouts and notes
- Clipboard and notebook paper
- Pens & pencils (the latter for rain)
- Plastic bags to keep things dry
- Re-usable water bottle
- Sleeping bag
- Flashlight & extra batteries
- Small daypack to carry your things
- Bug head net or jacket (optional)
- Rubber boots
- Hiking boots
- Sneakers or sandals
- Slippers to wear in the cookhouse
- Wind jacket
- Raingear (jacket & pants)
- Long pants, long sleeved shirts
- Ball cap or hat with sun brim
- Sunglasses
- Warm hat and gloves
- Sweater, sweatshirt or fleece jacket
- Hair ties for long hair
- Underwear/socks
- Long underwear for cool nights
- Swimsuit (optional)
- Sunscreen, insect repellent
- Personal toiletries, toothbrush& paste, soap, shampoo, towel
- Prescriptions drugs you need to take allergy medication (e.g. Benedryl)
- Aspirin/Tylenol/ibuprofen
- Cash (if you need to buy anything)
- Novel or other reading (optional)
- PC Laptop for GIS work
- Other laptop (optional; wireless satellite internet available
- Field guides (optional)
- Binoculars (optional)
- Camera (optional)

**ACCOMMODATION POLICY FOR STUDENTS**

Students may request accommodation as a result of barriers related to disability, religious obligation, or any characteristic protected under Canadian Human Rights legislation. The full text of Dalhousie's Student Accommodation Policy can be accessed here: http://www.dal.ca/dept/university_secretariat/policies/academic/student-accommodation-policy-wef-sep--1--2014.html

Students who require accommodation for classroom participation or the writing of tests and exams should make their request to the **Advising and Access Services Centre (AASC)** prior to or at the outset of the regular academic year. More information and the ***Request for Accommodation*** form are available at www.dal.ca/access.

**ACADEMIC INTEGRITY**

Academic integrity, with its embodied values, is seen as a foundation of Dalhousie University. It is the responsibility of all students to be familiar with behaviours and practices associated with academic integrity. Instructors are required to forward any suspected cases of plagiarism or other forms of academic cheating to the Academic Integrity Officer for their Faculty.

The Academic Integrity website (http://academicintegrity.dal.ca) provides students and faculty with information on plagiarism and other forms of academic dishonesty, and has resources to help students succeed honestly. The full text of Dalhousie's ***Policy on Intellectual Honesty*** and ***Faculty Discipline Procedures*** is available here:

http://www.dal.ca/dept/university_secretariat/academic-integrity/academic-policies.html

**STUDENT CODE OF CONDUCT**

Dalhousie University has a student code of conduct, and it is expected that students will adhere to the code during their participation in lectures and other activities associated with this course. In general:

"The University treats students as adults free to organize their own personal lives, behaviour and associations subject only to the law, and to University regulations that are necessary to protect

- the integrity and proper functioning of the academic and non – academic programs and activities of the University or its faculties, schools or departments;
- the peaceful and safe enjoyment of University facilities by other members of the University and the public;
- the freedom of members of the University to participate reasonably in the programs of the University and in activities on the University's premises;
- the property of the University or its members."

The full text of the code can be found here:
http://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

**SERVICES AVAILABLE TO STUDENTS**

The following campus services are available to help students develop skills in library research, scientific writing, and effective study habits. The services are available to all Dalhousie students and, unless noted otherwise, are free.

| Service | Support Provided | Location | Contact |
|---|---|---|---|
| **General Academic Advising** | Help with<br>- understanding degree requirements and academic regulations<br>- choosing your major<br>- achieving your educational or career goals<br>- dealing with academic or other difficulties | **Killam Library Ground floor** Rm G28 ***Bissett Centre for Academic Success*** | In person: Killam Library Rm G28<br>By appointment:<br>- e-mail: advising@dal.ca<br>- Phone: (902) 494-3077<br>- Book online through MyDal |
| **Dalhousie Libraries** | Help to find books and articles for assignments<br>Help with citing sources in the text of your paper and preparation of bibliography | **Killam Library Ground floor**<br>Librarian offices | In person: Service Point (Ground floor)<br>By appointment:<br>Identify your subject librarian (URL below) and contact by email or phone to arrange a time:<br>http://dal.beta.libguides.com/sb.php?subject_id=34328 |
| **Studying for Success (SFS)** | Help to develop essential study skills through small group workshops or one-on-one coaching sessions<br>Match to a tutor for help in course-specific content (for a reasonable fee) | **Killam Library 3rd floor**<br>Coordinator Rm 3104<br>Study Coaches Rm 3103 | To make an appointment:<br>- Visit main office (Killam Library main floor, Rm G28)<br>- Call (902) 494-3077<br>- email Coordinator at: sfs@dal.ca or<br>- Simply drop in to see us during posted office hours<br>**All information can be found on our website: www.dal.ca/sfs** |

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| **Writing Centre** | Meet with coach/tutor to discuss writing assignments (e.g., lab report, research paper, thesis, poster)<br>- Learn to integrate source material into your own work appropriately<br>- Learn about disciplinary writing from a peer or staff member in your field | **Killam Library Ground floor** Learning Commons & Rm G25 | To make an appointment:<br>- Visit the Centre (Rm G25) and book an appointment<br>- Call (902) 494-1963<br>- email writingcentre@dal.ca<br>- Book online through MyDal<br>We are open six days a week<br>**See our website: writingcentre.dal.ca** |