Monday, August 25, 2025

Introduction to Geospatial Programming

Academic Year: Fall 2025

Course Title: Introduction to Geospatial Programming

Course number: GEOM2005

Department: Geography and Environmental Sciences

Brightspace: https://brightspace.carleton.ca/d2l/home/370319

Instructor and TAs

Instructor: Galina Jonat

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TA: Owen Kirkham

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Office hours. TBD

Course Description

Computer programming for geomatics students focusing on storage, manipulation, management, visualization and analysis of geospatial data; Essential coding concepts and best practices including variables, loops, and conditional statements; programmatic handling of raster and vector data structures; and map production; GIS tool customization.

Preclusions

None

Learning Outcomes

By the end of this course, students will be able to:

- Describe the various scenarios in which using a programming environment for geospatial problems is beneficial overusing GUI based applications
- Explain basic programming concepts such as variables, conditional statements, and loops
- Write computer programs utilizing aforementioned concepts
- Develop programs for geospatial analysis
- Build on concepts to further develop their computer programming skills

Texts and Course Materials

Reference Books:

Severance, C. (with Open Textbook Library). (2016). *Python for Everybody: Exploring Data Using Python 3*. Charles Severance. Available at https://open.umn.edu/opentextbooks/textbooks/336 as PDF (Free)

Shaw, Z., & Shaw, Z. (2024). Learn Python the hard way: A deceptively simple introduction to the terrifyingly beautiful world of computers and data science (Fifth edition). Addison-Wesley. Available via https://learnpythonthehardway.org/ (USD 39.99 for hard copy)

Course Calendar

Week	Topic	Lab Assignment
Week 1: September 1-7	No lecture	No Lab
Week 2: September 8-14	Introduction	Set Up Lab Environment
Week 3: September 15-21	Variables and Program Breakdown	A1: Variables and Program Breakdown
Week 4: September 22-26	Conditional Statements	A2: Conditional Statements
Week 5: September 29-October 5	For Loops	A3: For Loops
Week 6: October 6-12	More Data Structures	A4: Data Structures
Week 7: October 13-19	Pandas **MIDTERM QUIZ (TBC)**	A5: Pandas
October 20-26	BREAK	
Week 8: October 27-November 2	Functions	A6: Functions
Week 9: November 3-9	Geopandas and RasterIO	A7: Geopandas
Week 10: November 10-16	Plotting and Object-Oriented Programming	A7: Geopandas Contd.
Week 11: November 17-23	**FINAL QUIZ (TBC)**	A8: Plotting and OO Lab
Week 12: November 24 – November 30	ArcPy	A9: ArcPy Lab/A10: Alt. Assignment
Week 13: December 1-5	A9: ArcPy Lab Contd. /A10: Alt. Assign. (Own time)	A9: ArcPy Lab Contd. /A10: Alt. Assign. (Own time)

Assignments are due on Tuesday at 11.59pm of the week (or two weeks, for A7-A10) following its introduction.

Evaluation

- Lab Assignments (82%)
  - Assignment 1 – 4: 5 points
  - Assignment 5 – 6: 10 points
  - Assignment 7-10 : 14 points
    - Need to complete only Assignment 9 or Assignment 10.
- Mid-term quiz (6%) – in-class multiple-choice
- Final Quiz (12%) – in-class multiple-choice

Standing in a course is determined by the course instructor subject to the approval of the Faculty Dean. This means that grades submitted by the instructor may be subject to revision. No grades are final until they have been approved by the Dean.

Lecture/Lab attendance : This module is delivered in person. You are required to attend 70% of lectures and labs to pass this course.

Late Policy: All submissions are online at Brightspace. No late assignments will be accepted , with the exception of medical issues/illness or if you have already arranged for an academic accommodation as described in subsequent sections of this syllabus. In such cases you must make arrangements with the TA at least 24 hours prior to the due date. It is your responsibility to ensure that the instructor or TA receive your submitted hard copies. If you are unable to submit an assignment in Brightspace, it is recommended that you email the instructor or TA with a copy. However, this option should only be considered as a last resort.

Submission of Work More Than Once for Academic Credit: If you wish to build on or re-use your own previous work (from this course or another course), you must first consult with the instructor and provide appropriate citation. Assignments may have changed from when you previously took the course, and it is your responsibility to ensure that your submission is aligned with the current assignment.

Academic accommodation: Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The accommodation request processes, including information about the Academic Consideration Policy for Students in Medical and Other Extenuating Circumstances, are outlined on the Academic Accommodations

website (students.carleton.ca/course-outline).

Generative Artificial Intelligence

Students may use AI tools for sharing ideas, clarifying challenging, concepts, getting started on projects. Some acceptable uses include:

- Brainstorming ideas
- Seeking assistance in definition or explanation of complex concepts
- Seeking assistance in figuring out small coding errors

The goal of adopting a limited use of AI is to help students develop foundational skills in coding and critical thinking by applying fundamental concepts of scripting without the support of AI. This policy ensures that students can test their understanding of such concepts before delving deeper into the tasks.

As our understanding of the uses of AI and its relationship to student work and academic integrity continue to evolve, students are required to discuss their use of AI in any circumstance not described here with the course instructor to ensure it supports the learning goals for the course.

Statement on Academic Integrity

Statement on Plagiarism

The University Academic Integrity Policy defines plagiarism as "*presenting, whether intentionally or not, the ideas, expression of ideas or work of others as one's own."* This includes reproducing or paraphrasing portions of someone else's published or unpublished material, regardless of the source, and presenting these as one's own without proper citation or reference to the original source. Examples of sources from which the ideas, expressions of ideas or works of others may be drawn from include but are not limited to: books, articles, papers, literary compositions and phrases, performance compositions, chemical compounds, artworks, laboratory reports, research results, calculations and the results of calculations, diagrams, constructions, computer reports, computer code/software, material on the internet and/or conversations.

Examples of plagiarism include, but are not limited to:

- any submission prepared in whole or in part, by someone else;

- using ideas or direct, verbatim quotations, paraphrased material, algorithms, formulae, scientific or mathematical concepts, or ideas without appropriate acknowledgment in any academic assignment;
- using another's data or research findings without appropriate acknowledgement;
- submitting a computer program developed in whole or in part by someone else, with or without modifications, as one's own; and
- failing to acknowledge sources through the use of proper citations when using another's work and/or failing to use quotations marks.

Plagiarism is a serious offence that cannot be resolved directly by the course's instructor. The Associate Dean of the Faculty conducts a rigorous investigation, including an interview with the student, when an instructor suspects a piece of work has been plagiarized. Penalties are not trivial. They can include a final grade of "F" for the course.

Statement on Student Mental Health

As a University student you may experience a range of mental health challenges that significantly impact your academic success and overall well-being. If you need help, please speak to someone. There are numerous resources available both on- and off-campus to support you. Here is a list that may be helpful:

Emergency Resources (on and off campus): https://carleton.ca/health/emergencies-and-crisis/emergency-numbers/

Carleton Resources:
• Mental Health and Wellbeing: https://carleton.ca/wellness/
• Health & Counselling Services: https://carleton.ca/health/
• Paul Menton Centre: https://carleton.ca/pmc/
• Academic Advising Centre (AAC): https://carleton.ca/academicadvising/
• Centre for Student Academic Support (CSAS): https://carleton.ca/csas/
• Equity & Inclusivity Communities: https://carleton.ca/equity/

Off Campus Resources:
• Distress Centre of Ottawa and Region: (613) 238-3311 or TEXT: 343-306-5550, https://www.dcottawa.on.ca/
• Mental Health Crisis Service: (613) 722-6914, 1-866-996-0991, http://www.crisisline.ca/
• Empower Me: 1-844-741-6389, https://students.carleton.ca/services/empower-me-counselling-services/

• Good2Talk: 1-866-925-5454, https://good2talk.ca/
• The Walk-In Counselling Clinic: https://walkincounselling.com

Requests for Academic Accommodations

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

Pregnancy obligation
Write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For accommodation regarding a formally-scheduled final exam, you must complete the Pregnancy Accommodation Form (click here).

Religious obligation
Write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details click here.

Academic Accommodations for Students with Disabilities
The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable).

Survivors of Sexual Violence
As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: https://carleton.ca/equity/sexual-assault-support-services

Accommodation for Student Activities

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation will be provided to students who compete or perform at the national or international level. Write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf