

cuFall 2023 – Introduction to Geospatial Programming – GEOM2005 Department of  
Geography and Environmental Studies  
Carleton University

**Academic Year:** Fall 2023

**Course Title:** Introduction to Geospatial Programming

**Department:** Department of Geography and Environmental Studies

**Course number:** GEOM 2005

**Instructor:** Dipto Sarkar ([dipto.sarkar@carleton.ca](mailto:dipto.sarkar@carleton.ca))

**Phone:** +1 6135202600x8439

**Office Hours:** Thursdays 11:00-12:00

**I. 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.

**II. Preclusions:** None

**III. 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

**IV. Texts:**

**Reference Books:**

1. Python for Everybody by Dr. Charles R. Severance. Available as a [PDF](#), [HTML](#), or to [Buy](#)
2. Learn Python the Hard Way by Zed A. Shaw. Available to [Buy](#)

**V. Course calendar (tentative: dates and topics subject to change):**

Week	Topic	Lab Assignment
Week 1: September 6-10		No Lab
Week 2: September 11-17	Introduction	Set Up Lab Environment
Week 3: September 18-24	Variables and Program Breakdown	A1: Variables and Program Breakdown
Week 4: September 25-October 1	Conditional Statements	A2: Conditional Statements
Week 5: October 2-8	For Loops	A3: For Loops

Week 6: October 9-15	More Data Structures	A4: Data Structures
Week 7: October 16-22	Pandas <b>MIDTERM QUIZ</b>	A5: Pandas
	BREAK	
Week 8: October 30-November 5	Functions	A6: Functions
Week 9: November 6-12	Geopandas and RasterIO	A7: Geopandas
Week 10: November 13-19	Plotting and Object-Oriented Programming	A7: Geopandas Contd.
Week 11: November 20-26	ArcPy	A8: Plotting and OO Lab Contd.
Week 12: November 27-December 3	<b>FINAL QUIZ</b>	A9: ArcPy Lab/A10: Alt. Assignment
Week 13: December 8	A9: ArcPy Lab Contd. /A10: Alt. Assign. (Own time)	

## VI. 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%)
- Final Quiz (12%)

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 course instructor 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.

## VII. 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.

## VIII. 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>

## IX. Statement on Pandemic Measures

It is important to remember that COVID is still present in Ottawa. The situation can change at any time and the risks of new variants and outbreaks are very real. There are [a number of actions](#)

[you can take](#) to lower your risk and the risk you pose to those around you including being vaccinated, wearing a mask, staying home when you're sick, washing your hands and maintaining proper respiratory and cough etiquette.

**Feeling sick?** Remaining vigilant and not attending work or school when sick or with symptoms is critically important. If you feel ill or exhibit COVID-19 symptoms do not come to class or campus. If you feel ill or exhibit symptoms while on campus or in class, please leave campus immediately. In all situations, you should follow Carleton's [symptom reporting protocols](#).

**Masks:** Masks are no longer mandatory in university buildings and facilities. However, we continue to recommend masking when indoors, particularly if physical distancing cannot be maintained. We are aware that personal preferences regarding optional mask use will vary greatly, and we ask that we all show consideration and care for each other during this transition.

**Vaccines:** While proof of vaccination is no longer required to access campus or participate in in-person Carleton activities, it may become necessary for the University to bring back proof of vaccination requirements on short notice if the situation and public health advice changes. Students are strongly encouraged to get a full course of vaccination, including booster doses as soon as they are eligible and submit their booster dose information in [cuScreen](#) as soon as possible. Please note that Carleton cannot guarantee that it will be able to offer virtual or hybrid learning options for those who are unable to attend the campus.

All members of the Carleton community are required to follow requirements and guidelines regarding health and safety which may change from time to time. For the most recent information about Carleton's COVID-19 response and health and safety requirements please see the [University's COVID-19 website](#) and review the [Frequently Asked Questions \(FAQs\)](#). Should you have additional questions after reviewing, please contact [covidinfo@carleton.ca](mailto:covidinfo@carleton.ca).

## **X. 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](mailto: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>