

**GEOGRAPHY AND ENVIRONMENTAL STUDIES**  
**Carleton University**

**COURSE OUTLINE - Winter 2022**

- COURSE:** Applications in Geographic Information Systems – GEOM 4009A
- PREREQUISITES:** GEOM 3005 & (COMP 1006 or GEOG 3003), or permission of the department.
- WORKSHOPS:** Wednesdays 08:35 - 11:25 Loeb A237
- INSTRUCTOR:** **Derek Mueller**  
Room A427, Loeb Building  
Email: [derek.mueller@carleton.ca](mailto:derek.mueller@carleton.ca)  
Phone: 613-520-2600 x1984
- OFFICE HOURS:** Mondays 11:30 to 12:30, by chance or appointment.

**COURSE DESCRIPTION:**

Project design and customization, application development within a GIS, digital atlas compilation and geomatics education (*from Carleton University, Undergraduate Calendar*).

The course is delivered as a 3 hour workshop which will entail both lecture and practical work. The intent of this course is to provide you with the tools needed to develop applications in Python that allow for automation to solve geomatics problems. You will be introduced to the Python programming language (open source language) and various libraries that can manipulate geospatial data.

QGIS and the Graphical Modeler may also be used. Other programming options available within other GIS platforms/software applications may also be explored. Existing scripts and extensions will be analyzed in order to understand how they can be used to perform a task and you will develop new tools directed to specific problems. The application of these tools will be in the areas of: customization of spatial analysis and batch automation of geoprocessing operations.

**COMMUNICATION:**

This course uses Brightspace, Carleton's learning management system to disseminate materials and for discussion. To access your courses on Brightspace go to <http://brightspace.carleton.ca>. For help and support, go to <http://carleton.ca/students>. Any unresolved questions can be directed to Information Technology Services (ITS) by phone at 613-520-3700 or via email at [its.service.desk@carleton.ca](mailto:its.service.desk@carleton.ca).

**Private correspondence with the instructor should be through a Carleton email account.** If you have questions of a general nature, please post these to the discussion board in Brightspace so that others can benefit from the answers. The instructor will check email and Brightspace every 24 hours and do their best to respond to queries within 48 hours.

Information on Brightspace or sent via email will be considered to have been provided to all students within 24 hours of posting and students will be fully responsible for reading and responding appropriately to this information.

**COURSE STRUCTURE:**

A one term course with workshops, assignments and a group project.

**TEXTBOOK/READINGS:**

You will find what you need online in various locations (primarily via a search engine). If you want to get a

head start on Python programming in general (you need a foundation in that before looking at geospatial applications) have a look at any Python textbook (books by O'Reilly publishing are good). The Python lessons in Software Carpentry are recommended: <https://swcarpentry.github.io/python-novice-inflammation/>. Other documentation will be provided as pdf files or web links via cuLearn.

### TECHNOLOGICAL REQUIREMENTS:

For the first 3 weeks of term (at least) this course will be delivered in a synchronous online mode. You will need a computer with a 64-bit CPU along with at least 8 GB RAM, 15-25 GB of free hard disk space and a high speed Internet connection. All the software you require will be freely available for Windows/Mac/Linux via conda and QGIS. Environment setup instructions will be provided but you will likely need admin permissions to install and configure the software. If, for some reason, students cannot install the environment correctly, a virtual machine will be supplied. Once we get the all clear to return to campus, this course will be delivered as in-person workshops using computers in Loeb A237. The plan then is that all necessary software will be provided in a conda environment on these machines that students can access.

### EVALUATION:

The evaluation in this course will be based upon your performance in the following:

Participation	16%
Weekly Assignments	36%
Group Project Progress Report1	05%*
Group Project Progress Report2	12%*
Group Project Progress Report3	06%*
Group Project Progress Report4	08%*
Group Project Final Report	12%*
Group Project Presentation	05%*

\*Note: Group project grades will be modified according to the peer evaluation multiplier (see below)

### Peer evaluation

All group project grades will be adjusted by a multiplier according to a peer evaluation performed at the end of the class. The Peer Evaluation Multiplier (PEM) is calculated by dividing the average peer evaluation score for each person by the average peer evaluation score of the group. It is then limited within the 0.75-1.25 range before being applied to group marks. For example:

PEM Calculation Example: For member X in group 1  
Average peer evaluation score for member X = 32  
Average peer evaluation score for entire group = 30  
PEM = 32/30 or 1.07  
Group Project grade (weighted mean of 6 group grades as above) = 80%  
Member X Mark for Group Project = 80 \* 1.07 = 85.6%

The instructor reserves the right to adjust the ratio from the peer evaluation in exceptional circumstances.

Note that 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. Also, due to COVID-19, flexible and compassionate grading options/accommodations can be made.

### Participation

You are either here for the *entire* workshop, or you are not. Likewise, you are either asking questions and participating in discussions, or you are not. Think of this as ~1.5% per week with a discretionary absence or lack of participation in 2 weeks. Note that participation in the group project will be evaluated separately.

Participation will be split into three components: Attendance; Engagement in the workshops (asking questions, offering points of view/information, submitting short in-class assignments); Completion of a short online quizzes between the end of the workshop and 23:55 that same evening.

### **Weekly Assignments**

After most of the weekly workshops there will be a short assignment that will help students consolidate what they learned. e.g., work on a piece of code. Best 6 of 8 assignments @ 6% each.

### **Group Project and Progress Reports**

For this group (3 to 5 students) project you will be required to address a real world request to develop/extend functionality in a geospatial workflow for an organization. You will meet with the 'client', research the topic and develop tools (scripts) and fully document them to meet the needs of the project. The projects and the group membership will be assigned in class.

A series of progress reports for the group projects is required to ensure a continuing flow of progress during this course. Each group will make 4 progress reports. Groups will make a final presentation on the last day of class and hand in a final report with scripts and documentation at the end of term.

Since a large portion of your mark is based on a group effort, you will be asked to comment on and score the participation of each member of your group (including yourself). The scores will be used to determine the Peer Evaluation Multiplier (see above), which will change your grade for the group project based on your contribution.

### **Other Information**

Technical problems occasionally cause delays. Every effort will be made to prevent this from the lab systems perspective. It is your responsibility to reduce your exposure to potential problems by reading and listening to all instructions thoroughly and carefully, and taking care to avoid risky practices. You must practice careful file management (saving files in the proper directories, deleting all unwanted files, naming files thoughtfully, and keeping track of where everything is) at all times.

### **Late Policy**

No late submissions will be accepted for the group project deliverables. Weekly assignments are time stamped by culearn upon receipt and the time they are late will be rounded up to the nearest hour. Each student can be late up to 48 hours *in total* without penalty. After this number of late hours is accumulated, any subsequent *late submission* for weekly assignments will receive zero. Students with medical or extenuating circumstances which cover the duration of the assignment period will be accommodated. However, students who anticipate missing course deadlines for these reasons must notify the instructor as soon as possible. Please complete the Medical Self-Declaration form available [here](#) as appropriate.

### **Student Conduct:**

Carleton University strives to provide a safe environment conducive to personal and intellectual growth, free of injustice and characterized by understanding respect, peace, trust, and fairness. The [Student Rights and Responsibilities Policy \(PDF, 1MB\)](#) governs the non-academic behaviour of students and more information is available at: <https://carleton.ca/studentaffairs/student-rights-and-responsibilities/>.

The University has adopted a policy to deal with academic integrity and allegations of academic misconduct. This policy is expressed in the document [Carleton University Academic Integrity Policy](#). The policy describes in detail its scope of application, principles, definitions, rights and responsibilities, academic integrity standards, procedures, sanctions, transcript notations, appeal process, and records implications.

### **Plagiarism:**

The University Senate 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, art works, 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 or even suspension or expulsion from the University.

#### **Academic Accommodation:**

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 instructors 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](#).

**Religious obligation:** write to instructors 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>

**Special Information Regarding Winter 2022 Pandemic Measures:**

All members of the Carleton community are required to follow COVID-19 prevention measures and all mandatory public health requirements (e.g. wearing a mask, physical distancing, hand hygiene, respiratory and cough etiquette) and [mandatory self-screening](#) prior to coming to campus daily.

If you feel ill or exhibit COVID-19 symptoms while on campus or in class, please leave campus immediately, self-isolate, and complete the mandatory [symptom reporting tool](#). For purposes of contact tracing, attendance will be recorded in all classes and labs. Participants can check in using posted QR codes through the cuScreen platform where provided. Students who do not have a smartphone will be required to complete a paper process as indicated on the [COVID-19 website](#).

All members of the Carleton community are required to follow guidelines regarding safe movement and seating on campus (e.g. directional arrows, designated entrances and exits, designated seats that maintain physical distancing). In order to avoid congestion, allow all previous occupants to fully vacate a classroom before entering. No food or drinks are permitted in any classrooms or labs.

For the most recent information about Carleton's COVID-19 response and required measures, please see the [University's COVID-19 webpage](#) and review the [Frequently Asked Questions \(FAQs\)](#). Should you have additional questions after reviewing, please contact [covidinfo@carleton.ca](mailto:covidinfo@carleton.ca)

Please note that failure to comply with University policies and mandatory public health requirements, and endangering the safety of others are considered misconduct under the [Student Rights and Responsibilities Policy](#). Failure to comply with Carleton's COVID-19 procedures may lead to supplementary action involving Campus Safety and/or Student Affairs.

**Cell phones and social media:**

Students must turn off their cell phones before each class. Interruption of classes by users of cell phones is disruptive and distracting for instructors and students alike. Consultation of social media during classes is similarly inappropriate.

**Uploading of course materials:**

Classroom teaching and learning activities, including lectures, discussions, presentations, etc., by both instructors and students, are copy protected and remain the intellectual property of their respective author(s). All course materials, including PowerPoint presentations, outlines, and other materials, are also protected by copyright and remain the intellectual property of their respective author(s).

Students registered in the course may take notes and make copies of course materials for their own educational use only. Students are not permitted to reproduce or distribute lecture notes and course materials publicly for commercial or non-commercial purposes without express written consent from the copyright holder(s).

**CLASS SCHEDULE/TOPICS (Subject to modification!!)**

<b>Month</b>	<b>Day</b>	<b>Topic</b>	<b>Assign.</b>	<b>Notes</b>
Jan	12	01 – Introduction to the course, QGIS, Graphical modeler	1	
	19	02 – Python basics 1 – IDEs, data types, flow control	2	
	26	03 – Python basics 2 – functions, using libraries	3	Group projects assigned
Feb	02	04 – Python basics 3 – object-oriented paradigm	4	
	09	05 – Project management	5	Project progress report 1 due
	16	06 – Geospatial libraries 1	6	
	23	READING WEEK – NO CLASS		
Mar	02	07 – Geospatial libraries 2	7	Project progress report 2 due
	09	08 – Geospatial libraries 3	8	
	16	09 – Python debugging, error handling, version control		Project progress report 3 due
	23	10 – TBD / Work on Projects		
	30	11 – TBD / Work on Projects		Project progress report 4 due
Apr	06	12 – Project Presentations		Project final report due