

GEOGRAPHY AND ENVIRONMENTAL STUDIES
Carleton University

COURSE OUTLINE - Winter 2023

COURSE:	Custom Geomatics Applications – GEOM 4009A
PREREQUISITES:	GEOM 2005 and (GEOM 3002 or GEOM 3005 or GEOM 3007), or permission of the department.
WORKSHOPS:	Fridays 08:35 - 11:25
INSTRUCTOR:	Derek Mueller Email: derek.mueller@carleton.ca Phone: 613-520-2600 x1984
OFFICE HOURS:	By appointment

COURSE DESCRIPTION:

Development and implementation of custom geomatics applications and workflows using programming and various geoprocessing tools. Project design, application development, GIS automation and documentation. (*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 using the Python programming language (open source language) and various open source libraries that can manipulate geospatial data. QGIS and 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.

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 team 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 if you need a refresher: <https://swcarpentry.github.io/python-novice-inflammation/>. Other documentation will be provided as pdf files or web links via Brightspace or on <https://github.com/GEOM4009>.

TECHNOLOGICAL REQUIREMENTS:

This course will be delivered as in-person workshops using computers in Loeb A237. If you do not want to use one of the lab computers in Loeb A237, 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.

EVALUATION:

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

Short Assignments	24%
Code-And-Tell Assignment	10%
Participation	18%
Team Project Progress Report1	05%*
Team Project Progress Report2	12%*
Team Project Progress Report3	06%*
Team Project Progress Report4	08%*
Team Project Final Report	12%*
Team Project Presentation	05%*

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

Peer evaluation

All team 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 team. It is then limited within the 0.75-1.25 range before being applied to team marks. For example:

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

The instructor reserves the right to adjust the ratio from the peer evaluation in exceptional circumstances. For more information see: <https://github.com/derekmueller/peereval>

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.

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. Note that participation in the team project will be evaluated

separately. The participation grade will be split into three components: Attendance; Engagement in the workshops (asking questions, offering points of view/information, submitting in-class assignments); Completion of short online quizzes within 48 hours of the end of select workshops.

Code-And-Tell Assignments

Students will pick a Python package from a list of options, present it to the class and provide a 1-2 page handout that provides a description of the package, what it is used for, how it relates to other packages and some material to help learn the basics.

Short Assignments

After some 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 4 of 6 assignments @ 6% each.

Team Project and Progress Reports

For this team (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 team membership will be assigned in class.

A series of progress reports for the team projects is required to ensure a continuing flow of progress during this course. Each team will make 4 progress reports. Teams 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 team effort, you will be asked to comment on and score the participation of each member of your team (including yourself). The scores will be used to determine the Peer Evaluation Multiplier (see above), which will change your grade for the team project based on your contribution.

Note that we will be using GitHub (<https://github.com/>) to manage team projects and for version control. Students will be given their own space to work in the GEOM4009 organization (<https://github.com/geom4009>) and will be **expected to release their team project repository publicly at the end of term**. Please note that students are under no obligation to use their real names in any of the project documentation or link any personal information to their github account (i.e., your username can be an alias).

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 team project and code-and-tell deliverables. Short assignments are time stamped by Brightspace 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 *prior to* the deadline in question. Please complete the Medical Self-Declaration form available [here](#) as appropriate.

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.

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. The university’s full Academic Integrity Policy can be found [here](#).

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>

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 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>

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 must follow Carleton's [symptom reporting protocols](#).

Masks: Carleton has paused the [COVID-19 Mask Policy](#), but continues to strongly recommend masking when indoors, particularly if physical distancing cannot be maintained. It may become necessary to quickly reinstate the mask requirement if pandemic circumstances were to change.

Vaccines: Further, while proof of vaccination is no longer required as of May 1 to attend campus or in-person activity, 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.

Other Important Locations on Campus:

Writing Services <https://carleton.ca/csas/writing-services/> (506 and 507 MacOdrum Library)

Centre for Student Academic Support <https://carleton.ca/csas/> (CSAS, 2nd Floor, MacOdrum Library)

CLASS SCHEDULE/TOPICS (Subject to modification!!)

Month	Day	Topic	Assign.	Notes
Jan	13	01 – Introduction and review	1	
	20	02 – Applications development environments	2	
	27	03 – Command line and spawning jobs	3	Team projects assigned
Feb	03	04 – Errors and bugs		
	10	05 – Working as a team		Project progress report 1 due
	17	06 – Visualizations	4	
	24	READING WEEK – NO CLASS		
Mar	03	07 – Advanced geospatial libraries - vector	5	Project progress report 2 due
	10	08 – Advanced geospatial libraries - raster	6	
	17	09 – Packaging, sharing and documenting code		Project progress report 3 due
	24	10 – TBD / Work on Projects		
	31	11 – TBD / Work on Projects		Project progress report 4 due
Apr	07	GOOD FRIDAY – NO CLASS		
	12	12 – Project Presentations		Project final report due