

GEOGRAPHY AND ENVIRONMENTAL STUDIES
Carleton University

COURSE OUTLINE - Winter 2020

COURSE: Applications in Geographic Information Systems – GEOM 4009A

INSTRUCTOR: **Derek Mueller**
Room A427, Loeb Building
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Phone: 613-520-2600 x1984

OFFICE HOURS: Wednesdays 10:30-11:30, by chance or appointment.

PREREQUISITES: GEOM 3005

WORKSHOPS: Mondays 14:35 - 17:25 Loeb A237

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. ArcGIS and a variety of extensions will be used in this course. The intent of this course is to provide you with the tools needed to develop applications to solve geographic problems. You will be introduced to object-oriented programming principles using ModelBuilder (which is part of ArcGIS) and the Python programming language (open source language). Other programming options available within ArcGIS and other GIS platforms/software applications will 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: a) spatial analysis; b) batch and geoprocessing operations; c) geomatics education.

COMMUNICATION:

This course uses cuLearn, Carleton's learning management system. To access your courses on cuLearn go to <http://carleton.ca/culearn>. For help and support, go to <http://carleton.ca/students>. Any unresolved questions can be directed to Computing and Communication Services (CCS) by phone at 613-520-3700 or via email at ccs.service.desk@carleton.ca

Private correspondence with the Instructor should be through a Carleton email account (this is accessible in cuLearn). If you have questions of a general nature, please post it to the discussion board in cuLearn so that others can benefit from the answers. The Instructor will check email and cuLearn every 24 hours and do their best to respond to queries within 48 hours.

Information on cuLearn 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:

Any Python textbook will do but none are required (books by O'Reilly publishing are good). Other documentation will be provided as portable document (*.pdf) files or web links via cuLearn. You may also

benefit from materials available on GIS-related newsgroups, such as: <http://forums.arcgis.com/>

EVALUATION:

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

Attendance	05%
Weekly assignments	10%
Virtual campus courses	05%
Individual learning module	30%
Group project	50%

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.

Attendance

You are either here for the *entire* workshop, or you are not. Think of this as 0.5% per week with a discretionary absence of 2 weeks.

Weekly assignments

After nearly all of the weekly workshops there will be a short assignment that will help students consolidate what they learned. eg., build a model or work on a piece of code.

Virtual campus courses

This provides the student the chance to select a topic that may be of interest to them that aren't expressly covered in the course, or to examine a topic in more detail. The courses are online and must be completed within the first 4 weeks of class. Specific details will be discussed in class.

Progress reports

A series of progress reports for the individual and group projects is required to ensure a continuing flow of progress during this course.

Individual learning module

The learning module is done on an individual basis. You will develop learning materials, and scripts, tools and/or models, which explore aspects of spatial analysis or data transformation or manipulation. Topics may include, but are not limited to:

1. cartographic tools in GIS
2. projections/datums and their transformations
3. working with image data in GIS
4. spatial statistics
5. network analysis
6. analysis of grid data
7. comparison of analysis of vector and grid data
8. transitioning between GIS packages
9. batch processing of data or analyses

You will be required to submit a proposal for your learning module in week 3 (worth 5%). You will make a report on your progress in week 6 (5%) and you will complete your individual learning module in week 8 (20%) for a total of 30% of your course grade.

Group project

For this group project (3 to 4 people) you will be required to address a real world request to develop/extend GIS functionality within a work environment. You will meet with the 'client', research the topic and develop tools

(scripts and/or extensions) to meet the needs of the project. The projects and the group membership will be assigned in class (week 5).

Each group will make 3 progress reports (in weeks 7, 9 and 11 – each worth 5%), make a final presentation on the last day of class (5%) and hand in a final report with scripts (20%) 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 your participation within the group (list your contributions and describe where you provided leadership and helped your team-mates). This will be evaluated to determine your participation within your group (10%). This totals to 50% of your final grade.

Late policy

Late submissions will be accepted with a penalty of 10% off per calendar day (up to 4 days) for the individual learning module assignments only. No late submissions will be accepted for the weekly assignments, virtual campus or group project. Students with documented 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.

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.

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 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 see the [Student Guide](#)

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 see the [Student Guide](#)

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).

Student Conduct:

The University has adopted a policy to deal with allegations of academic misconduct. This policy is expressed in the document Carleton University Academic Integrity Policy, effective July 1, 2006. 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.

The complete policy is available at: <http://www2.carleton.ca/studentaffairs/student-rights-and-responsibilities/>

Plagiarism:

Plagiarism is presenting, whether intentional or not, the ideas, expression of ideas or work of others as one's own. Plagiarism 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, and material on the Internet.

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 can include:

- 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;
- submitting a take-home examination, essay, laboratory report or other assignment written, in whole or in part, by someone else;
- using ideas or direct, verbatim quotations, or paraphrased material, concepts, or ideas without appropriate acknowledgment in any academic assignment;
- using another's data or research findings;
- failing to acknowledge sources through the use of proper citations when using another's works and/or failing to use quotation marks;
- handing in "substantially the same piece of work for academic credit more than once without prior written permission of the course instructor in which the submission occurs."

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.

(see: <http://www2.carleton.ca/studentaffairs/academic-integrity> and <http://www.library.carleton.ca/help/avoid-plagiarism>)

Other Important Locations on Campus:

Paul Menton Centre (501 University Centre) for students needing accommodation

Writing Services <https://carleton.ca/csas/writing-services/> (4th Floor, Library)

Centre for Student Academic Support <https://carleton.ca/csas/> (CSAS, 4th Floor, Library)

CLASS SCHEDULE, TOPICS AND READING LIST (Subject to modification!!)

Month	Day	Topic	Notes
Jan	06	01 – Introduction to the course, ArcGIS Pro, Model builder	
	13	02 – Python basics 1 – IDEs, variables, data types	
	20	03 – Python basics 2 – slicing, flow control, modules	Learning module proposal due
	27	04 – Python basics 3 – functions and scripts	Virtual campus due
Feb	03	05 – Object-oriented paradigm, arcpy	Group projects assigned
	10	06 – Script tools/toolboxes	Learning module progress report due
	17	READING WEEK – NO CLASS	
	24	07 – Project management	Project progress report 1 due
Mar	02	08 – Python debugging, error handling, version control	Learning module due
	09	09 – gdal/ogr, geopandas and other geospatial libraries	Project progress report 2 due
	16	10 – QGIS and python	
	23	11 – Google API/Earth Engine or TBD	Project progress report 3 due
	30	12 – TBD	
Apr	06	13 – Project Presentations	Project final report due