

COMP 4202 [0.5 credit]

Prerequisite(s): [COMP 3804](#) or [MATH 3804](#).

Computational Aspects of Geographic Information Systems

Through recent advances in technology such as navigation systems, mobile devices, changing user demands and new software such as Mapquest and Google Earth, the field of GIS is becoming increasingly important and also very interesting from a CS perspective. Many aspects of our daily lives are effected, the commercial impact/potential of GIS is tremendous, and novel algorithmic and applied problems need to be solved. This course lays the foundations to understand, use and further this technology.

Learning Modality

In Fall 2022, content for this course will be delivered online. The plan is to do it as ZOOM Live Stream from a set-up I created at my home that includes whiteboards. Students can tune into at the scheduled time (see the lecture schedule below). We will do interaction during these lectures. The lectures will then be shared via Brightspace.

Prerequisite: A 3rd year course in Data Structures and Algorithms or the equivalent.

Course Objectives

This is a recent course for UG students. You will learn about Geographic Information, its principles, techniques used and analysis of geographic/spatial data. You will be able to understand what is inside a GIS, underlying algorithms and be able to use a system. Having taking this course, you will be able to answer e.g., how do they visualize disease spread, how does Google determine the best route algorithmically.

Lecture Schedule

Sep 07, 2022 - Dec 09, 2022

Days	Time Location
Tuesdays	10:05 -11:25 Lecture
Thursdays	10:05 -11:25 Lecture

The Zoom link will be sent to you via email.

The lectures will be available via Brightspace for subsequent viewing.

My office Hours Schedule

Days	Time Location
Wednesdays	14:00 -15:00 Online via Zoom

TA office Hours Schedule

Days	Time	Location
Tbd		Online via Zoom

Important Dates

Date	Due
September 29	Project and Class presentation proposal
October 13	Assignment 1
October 18 and 20 (November 1)	Class presentations (Presentations depending on demand)
November 17	Assignment 2
December 6	Project write-up
December 8	(Brief) project demos
December ?	Final: CU scheduled

Textbook

None. My students can access the Course Material via Brightspace.

Grading Scheme

I. 2 Assignments (each 15%)	30%
II. Class participation	expected
III. Choose exactly 2 out of these a, b, or c:	
a) Class presentation incl. write-up	20%
b) Project/Survey including write-up)	20%
c) Tutorials	20%
IV. Final exam	30%

Assignments

Assignments will be posted as they become available.

Please note the following rules and requirements about assignments:

- Late assignments will not be accepted.
- Assignments emailed to me will not be accepted.
- I will not respond to emails sent shortly before or after assignment deadlines asking for exceptions to the preceding two rules.
- You can type your solutions, or write them by hand and scan them (for example, using a scan app on your phone or using a real scanner).
- Solutions written-up in **LaTeX** are preferred, but not strictly required. In case you want to learn LaTeX, here is a **tutorial**. Learning LaTeX is a useful exercise, since **many programs (including Microsoft Word) now use LaTeX for typesetting formulas**.
- Each assignment must be submitted as one single PDF file through BrightSpace.

Project

This is the nicest part of the course. Students are almost always finding some project that they like. Projects can be implementation-oriented or theory-based. In almost all cases, I would recommend an implementation-oriented projects. **The class presentation and the topic of the project need to be distinct to allow for maximal learning.**

• Implementation Projects

For implementation projects you would typically implement different data structures or algorithms.

Then, their performance is established through rigorous experimental testing. The write-up contains a description of the data structures algorithms implemented and tested, the tests carried out and the results of the experiments. Should the results show interesting behaviours, they must be explored and discussed. Projects are e.g., finding “best” bicycle routes inside Ottawa, improving the OCTranspo system ...

You will get a chance to demonstrate your projects to me and your class mates in a special demonstration class.

• Theory Projects

Don't choose this if you are not research-oriented. You are encouraged to work on an open problem mentioned in class or stated in the literature. It may happen that you cannot solve the open problem proposed. In this case, you should describe the approaches attempted and the reasons why they did not work. Marking then focuses on the write-up, including the survey depth, and the strength of the approaches attempted.

Class presentations

The class presentations give you a great opportunity to practice giving a talk. Here, the objective is for you to learn to speak talk in front of people. This will be useful if you are in academia or industry. Then, the stakes are higher and it is nice to practice in front of equals. I will give you feedback how to improve. Depending on the class size, we might get 20 minutes per talk (t.b.d.).

Tutorials

ESRI has developed some tutorials to learn how to use its products. We are choosing several such tutorials that you go through, make snapshots of how you did and then add some additional tasks (which we will specify).

Exams

The final exam will take place online. The precise rules will be communicated later. At this point, the exam will be scheduled and monitored by Carleton University so that cheating is eliminated and fairness is guaranteed for all students.

Academic Integrity (New—Please Read)

As of 2020, there are penalties in place for academic integrity violations. These will be issued by the Associate Dean (Undergraduate Affairs) of Science to students who copy, in whole or in part, work they submit for assignments.

- First offence: F in the course
- Second offence: One-year suspension from program
- Third offence: Expulsion from the University

These are standard penalties. More-severe penalties will be applied in cases of egregious offences. Failure to inform yourself of the expectations regarding academic integrity is not a valid excuse for violations of the policy. When in doubt, ASK your instructor or TA. For more information check the [ODS website](#)

Undergraduate Academic Advisor

The Undergraduate Advisor for the School of Computer Science is available in Room 5302C HP; or by email at scs.ug.advisor@cunet.carleton.ca. The undergraduate advisors can assist with information about prerequisites and preclusions, course substitutions/equivalencies, understanding your academic audit and the remaining requirements for graduation. The undergraduate advisors will also refer students to appropriate resources such as the Science Student Success Centre, Learning Support Services and Writing Tutorial Services.

SCS Computer Laboratory

SCS students can access one of the designated labs for your course. The lab schedule can be found at: <https://carleton.ca/scs/tech-support/computer-laboratories/>. All SCS computer lab and technical support information can be found at: <https://carleton.ca/scs/technical-support/>. Technical support is available in room HP5161 Monday to Friday from 9:00 until 17:00 or by emailing SCS.Tech.Support@cunet.carleton.ca.

University Policies

For information about Carleton's academic year, including registration and withdrawal dates, see [Carleton's Academic Calendar](#).

Pregnancy Obligation. Please contact your instructor 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, visit [Equity Services](#).

Religious Obligation. Please contact your instructor 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, visit <https://carleton.ca/equity/focus/discrimination-harassment/religious-spiritual-observances/>.

Academic Accommodations for Students with Disabilities If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC 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 your instructor as soon as possible to ensure accommodation arrangements are made. For more details, visit the [Paul Menton Centre](#) website.

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 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: carleton.ca/sexual-violence-support

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 must be provided to students who compete or perform at the national or international level. Please contact your instructor 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 policy](#).

Student Academic Integrity Policy. Every student should be familiar with the Carleton University student academic integrity policy. A student found in violation of academic integrity standards may be awarded penalties which range from a reprimand to receiving a grade of *F* in the course or even being expelled from the program or University. Examples of punishable offences include: plagiarism and unauthorized co-operation or collaboration. Information on this policy may be found [here](#).

Plagiarism. As defined by Senate, "plagiarism is presenting, whether intentional or not, the ideas, expression of ideas or work of others as one's own". Such reported offences will be reviewed by the office of the Dean of Science. Standard penalty guidelines can be found [here](#).

Unauthorized Co-operation or Collaboration. Senate policy states that "to ensure fairness and equity in assessment of term work, students shall not co-operate or collaborate in the completion of an academic assignment, in whole or in part, when the instructor has indicated that the assignment is to be completed on an individual basis". Please refer to the course outline statement or the instructor concerning this issue.

Special Information

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 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: 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 website and review the Frequently Asked Questions (FAQs). Should you have additional questions after reviewing, please contact covidinfo@carleton.ca.

Doctor's note or medical certificate: in effect for Fall 2022 term. In place of a doctor's note or medical certificate, students are advised to complete the [self-declaration form](#) available on the Registrar's Office website to request academic accommodation for missed course work including exams and assignments. Students should also discuss with the course instructor the required accommodations arising from the COVID-19 situation.