GEOM 2008: Raster GIS: Pixels and Grids

Fall 2024 DRAFT Outline

Department of Geography and Environmental Studies - Carleton University

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Instructor: Scott Mitchell Email: Scott.Mitchell@carleton.ca
Office: Loeb A301B
Office Hour: TBD

TA: TBD

Lectures: Thursdays, 9h35-11h25
Labs: Thursdays, 11h35-13h25 (enrolment increases may require additional lab sections to be opened.)

This is an **in-person** course. If you are required to miss class due to illness but are well enough to continue with course activities, please contact the instructor as soon as possible to get guidance on how to participate from home as best possible.

Course Description

We will explore the following topics, enriching your knowledge and skills about raster-based GIS and remote sensing, and preparing you for more senior courses if you elect to continue:

- Storage, visualization, manipulation, and analysis of gridded geospatial data
- 3-D raster visualization
- digital terrain analysis
- spatial interpolation and filtering
- raster geoprocessing and projections
- selected topics in raster analysis such as least-cost path analysis, natural hazard
- assessment, pollution mapping, and hotspot analysis.

We will cover concepts, strengths and limitations of the raster spatial data format and analysis techniques. This will include practical experience working with such data and tools through lab exercises conducted using QGIS and ArcGIS Pro software.

Prerequisites: GEOM 1004 or permission of the department.

Learning Objectives – by the end of this course, students will:

- understand the theory and application of raster GIS data structures including concepts and techniques related to raster analysis and querying;
- possess the foundational knowledge and skills required for intermediate raster manipulation, including site suitability analysis using appropriate raster geoprocessing tools and least-cost path analysis;
- understand the types of problems that can be solved using raster-GIS analysis and be proficient with designing and implementing raster-based GIS problem solving workflows for spatial support for decision-making; and
- be proficient with several different GIS software tools for manipulating, analyzing and mapping data using rasters and their attributes for intermediate geospatial analysis.

Readings and support materials:

This course uses a mandatory textbook, available through the Carleton University Bookstore: Kang-Tsung Chang (2019), ISE Introduction to Geographic Information Systems, 9e. Digital and print versions are available.

Additional readings will be provided at times, digitally. Required and occasionally supplemental readings and resources will be posted on Brightspace on a weekly basis.

Evaluation:

Details of the grading scheme are still under development as of this writing, but will include a blend of labs, quizzes, a practical mid-term, and a final group project.

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.

Late Policy:

All assignments must be submitted through Brightspace by the due date and time. No late assignments will be accepted, with exception of cases where a student is sick or has already arranged for academic accommodation as described in subsequent sections of this outline. In the case of illness, you must make arrangements with the course instructor prior to the due date/time. In place of a doctor's note or medical certificate for short-term illnesses, students are advised to complete the self-declaration form available on the Registrar's Office website to request academic accommodation for missed coursework including exams and assignments.

Attendance at lectures and labs, and further time requirements:

Lectures will cover theoretical components of remote sensing and may also include software demonstrations. When possible, recordings of demonstrations will be made available for later review. Labs will include software demonstrations and one-on-one help will be available for software and practical related questions. You will be expected to attend these sessions to succeed in this course, and there will often be in-person assessment activities. If illness or other mutually-agreed-upon emergency situations develop, we will help you find a plan to keep up.

You will be responsible for completing lab assignments on your own time in addition to formally scheduled time in the lab. You will have access to our lab spaces to do this, any time a class is not using that space.

For group work, you will likely need to allocate time for the group to communicate to plan and coordinate project activities. Groups will schedule this on their own.

Quizzes (x%):

Quizzes will be conducted in class, supervised, through Brightspace. They will be primarily based on the text book readings, and will have firm due dates. If you miss a quiz for extenuating circumstances, contact the instructor to discuss possible accommodations.

Other deliverables: Detailed expectations and grading schemes for the labs, practical mid-term, and final group project will be provided on Brightspace as the term progresses. If you ever suspect that full instructions might be missing, please do not hesitate to ask the instructor for clarification / to see if something was inadvertently missed.

Course calendar: The order and duration of the topics listed above is still under development at this time, but will be added here for the final version of this outline, with further details added as needed through Brightspace.

Required software: This course will use ESRI ArcGIS Pro 3.3 and QGIS 3.32. Please see this page about software used in our program for links about minimum requirements for these programs, and how to access them to install on your own computers. You are welcome to use your own computers if you wish, however we do not make any assumptions that you will do that, and the computers in the lab are fully capable of everything we will do in this course. Please note that there are severe limitations on the possibility of running ArcGIS on a macOS computer (so severe that it is usually impossible), but QGIS is no problem.

If any other software is added to our mix, it will be available at no charge, and will likely be multi-platform.

Use of social media (Discord, other chat services, etc.):

I suspect that someone in the class will set up a Discord server or other opportunity for class members to chat and discuss class content, and potentially manage your group project requirements. If this is done, please make sure that everyone in the class is aware of the arrangements. If you are not familiar with the platform, please ask your classmates about it. The instructor or TA will not be part of any conversations using such channels, cannot provide support for such platforms, and nothing said there should be considered official communications about the class. All official communications will take place in person and on Brightspace.

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, including the unauthorized use of generative AI tools (e.g., ChatGPT);
- 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.

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.

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

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:

Academic consideration for medical or other extenuating circumstances: Students must contact the instructor as soon as possible, and preferably before and normally no later than 24 hours after the submission deadline for course deliverables. For short-term illnesses, 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 coursework including exams and assignments. That second link also includes information about longer-term requests.

Students should also consult the Course Outline Information on Academic Accommodations for more information. Detailed information about the procedure for requesting academic consideration can be found here.

Pregnancy and Family-Status Related Accommodation: Please write to me with any requests for academic accommodation during the first few weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details about the accommodation policy, visit the Equity and Inclusive Communities (EIC) website.

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 for a formal evaluation. If you are already registered with the PMC, please request your accommodations for this course through the Ventus Student Portal 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*). Requests made within two weeks will be reviewed on a case-by-case basis. For final exams, the deadlines to request accommodations are published in the University Academic Calendars. 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