GEOM 2008: Raster GIS: Pixels and Grids

Winter 2026 Course Outline

Department of Geography and Environmental Studies - Carleton University

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Instructor:	Scott Mitchell	Email:	Scott.Mitchell@carleton.ca
		Office:	Loeb A330
		Office Hour:	Tuesdays, 11h30-12h30
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Office hours online (email, forum) or by appointment

Lectures: Wednesdays, 9h35-11h25
Labs: Wednesday (A1), or Thursdays (A2), 11h35-13h25

This is an **in-person** course. If you are required to miss class due to illness, please contact the instructor as soon as possible to get guidance on how to participate from home as best possible if you are well enough to continue with some course activities, and/or how to get caught up in any case.

Please consult Brightspace for more information (link will only work for enrolled students).

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 software such as QGIS, SAGA, and ArcGIS Pro.

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 Campus Store; digital ($10 for 180 days) and print ($100) versions are available. Note that the same textbook is **also** used for GEOM 2007.

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

Course Timing:

GEOM 2008 Winter 2026 Term Plan

(Lecture activity timing subject to change; due dates are fixed unless technical challenges force revision)

Week	Lecture Activity*	Readings (TBC)	Lab Activity	Work due
1 (Jan 7, 8)	Course Intro, Raster Basics	Chapter 4	Intro Lab 1	
2 (Jan 14,15)	Raster Analysis	Chapter 12		
3 (Jan 21, 22)	Introduce projects, midterm		Intro Lab 2	Lab 1
4 (Jan 28, 29)	Creating elevation data from imagery, interpolation		Quiz 1	
5 (Feb 4, 5)	Image analysis		Intro Lab 3	Lab 2
6 (Feb 11, 12)	Terrain Analysis		Quiz 2	Group assignments
READING WEEK				
7 (Feb 25, 26)	Suitability analysis		Intro Lab 4	Lab 3
8 (Mar 4, 5)	Library resources		Quiz 3	Midterm presentations
9 (Mar 11, 12)	Least cost path analysis		Lab 5	Lab 4
10 (Mar 18, 19)	Other resources		Quiz 4	Lab 5
11 (Mar 25, 26)	Project presentations		Work on projects	Projects
12 (Apr 1, 2)	Project presentations			Projects

Evaluation:

Quizzes:	20%
Labs:	40%
Midterm (take-home exercise):	10%
Final group project:	30% (5% proposal, 25% presentation, peer evaluation)

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 for full marks. In the case of illness or other extenuating circumstances that delay your ability to submit a complete lab on time, you must make arrangements with the course instructor prior to the due date. 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. If you are late for other reasons, such as underestimating the time it would take to complete the lab, late submissions are accepted up to one week late, with 2% deducted for every day it is late.

Attendance at lectures and labs, and further time requirements:

Lectures will cover theoretical components of raster GIS and may also include software demonstrations. 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 (20%):

Quizzes will be conducted in class, supervised, through Brightspace. They will be primarily based on the textbook readings and lecture materials. 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.

Required software: This course will use ESRI ArcGIS Pro 3.4 and, optionally QGIS 3.42. 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.

Use of generative artificial intelligence:

Most of the work you will be evaluated on in this course cannot be achieved with AI tools, but you will be submitting written lab reports. Students may use AI tools for basic word processing functions, including grammar and spell checking (e.g. Grammarly, Microsoft Word Editor, Copilot), but all of the original content you are submitting must be generated by you. It is not necessary to document the use of AI for the permitted purposes listed above. If you have questions about a specific use of AI that isn't listed above, please consult your instructor / teaching assistant. This policy

ensures that student voices and ideas are prioritized and authentically represented, maintaining the integrity of the work produced by students while allowing basic support to enhance clarity, correctness, layout and flow of ideas. The goal of adopting a limited use of AI is to help students develop foundational skills in writing and critical thinking by practicing substantive content creation without the support of AI.

As our understanding of the uses of AI and its relationship to student work and academic integrity continue to evolve, students are required to discuss their use of AI in any circumstance not described here with the course instructor to ensure it supports the learning goals for the course.

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 follows a rigorous process for academic integrity allegations, including reviewing documents and interviewing the student, when an instructor suspects a violation has been committed. Penalties for violations may include a final grade of "F" for the course.

Statement on Student Mental Health:

As a 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.

For more information, please consult https://wellness.carleton.ca/

Requests for Academic Accommodations:

Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The accommodation request processes, including information about the Academic Consideration Policy for Students in Medical and Other Extenuating Circumstances, are outlined on the Academic Accommodations website (students.carleton.ca/course-outline).