CS 4803-GIS Syllabus

Geographic Information Systems & Computing, GIS, and 3 Credits
Summer (Maymester) 2026

Instructor Information

Instructor	Email	Office
Clio Andris	clio@gatech.edu For quick response try Microsoft Teams.	204-M East Architecture Building.

General Course Information

Description

Introduction to computing with spatial datasets, including lessons on geographic information fundamentals, projections, spatial operations, raster and imagery data analysis, and cartographic design principles that are used to digitally model social and environmental processes.

The primary objective for this course is to help students build a GIS portfolio for use in industry, government, NGOs, etc. The course exposes computation-focused students to maps, data analysis and methods in Geographic Information Systems and Science (GIS). It helps students learn the fundamentals of spatial data representation, formats, map projections, GIS operations and computing, cartography, and multi-criteria decision-making. Students are welcome to use a technology of their choice (such as Python or ArcPro), but labs will be primarily taught in the open-source QGIS computing environment and using PyQGIS. This course teaches students how to make maps using geodata visualization strategies and cartographic standards.

Pre- &/or Co-Requisites

No prerequisites are required, although a basic comfort with programming in python, java, or R is recommended. Students cannot get credit for this course and CP 4510 (Fundamentals of GIS). Students cannot get credit for this course and CP 6514 (Introduction to Geographic Information Systems). CP 4510 and CP 6514 use the ArcGIS Software Suite (ArcPro), whereas this class focuses on open source tools. However, students are welcome to use the software that they prefer.

Graduate students in any GT program are welcome to register for this class.

Course Learning Outcomes

1. Learn about how spatial data is collected, stored, retrieved and used
2. Describe the characteristics of different map projections and transformations
3. Explain data and table structures, including levels of measurements, normalization, and table joins
4. Retrieve, inspect and use GIS data sources such as hydrological, demographic, land use, elevation, roads, health statistics, etc.
5. Use spatial joins to combine spatial data layers
6. Analyze vector data using spatial interpolation, error, and estimation techniques
7. Orthorectify imagery and graphics into a GISystem using control points
8. Detect features in aerial imagery

9.   Analyze terrain of a digital elevation model including calculating slope, aspect and viewsheds
10.   Describe and use principles of cartography
11.   Complete an applied project that uses spatial data and analysis

Required Course Materials

Materials: Laptop computer is recommended. Students will be required to download QGIS.

Textbook: Bolstad, P. and Mason, S. (2023) *GIS Fundamentals*. This book/online resource can be purchased online at https://www.gisfundamentals.org/. **Reading the book will help you prepare for lectures and exams.**

Grading Policy

Students are expected to attend all lectures, read readings, and complete all assignments. There will be no official final exam. Late submissions will be graded down by 10% for each day of delay past the due time. All assignments should be handed in on Canvas. We follow the Georgia Tech grading scale.

Content	Number of Assignments	Total Points
GIS labs	10 (6 pts each)	60
GIS project (required)	1 (+Proposal)	15 (+5) = 20
In Class Work	2-5	10
Attendance		10

Description of Graded Components

GIS Labs are graded based on correct answers to questions asked in the labs, and effectiveness of maps and graphics.

GIS Project is graded based on completion of a project pitch, ability to pose an effective GIS question that uses geometric changes, data combination, or distance analysis, and derive a clear answer. A rubric is given out in class to describe the project more fully.

In Class Work is graded based on attendance, participation, and ability to turn in a file such as a code snippet or a kml file, or evaluation of a student's project.

Attendance is graded based on students arriving to class on time, staying until class is dismissed, and attending class each day.

Tentative Schedule

DAY/WEEK	Topic	Reading (GIS Fundamentals Book)
1	Introduction to Course, GIS	
	Lab 0: Cartography & Introduction to QGIS +	Introduction to Map Design (ESRI, 1996). To be posted on Canvas
2	Vector Data + Attributes; *Digging into Vector Data.*	CH 1: Introduction
	Lab 1: Making a thematic map	
3	Hist. of GIS; Data Models, Data Levels, Administrative Units + Carto	CH 2: Data Models
	Editing and Creating Data / KML	CH 4: Maps, Data Entry, Editing, Output

4		Projections + Transformations	CH 3: Geodesy, Datums, Map Projections and Coordinate Systems
		Lab 2: Projecting data	
5		Tables, Databases, Queries/SQL *Mapshaper Demo and Console*.	CH 8: Attribute Data and Tables
		Lab 3: GIS operations and analysis I	
6		GIS Operations for Vector Data	CH 9: Basic Spatial Analysis
		Lab 4: GIS operations and analysis II	(spatial joins, clips, intersection, buffer)
7		Geocoding, Creating and Editing Data	
		Lab 5: Geocoding, creating data, editing	Refresh of Chapter 4
8		Raster Data + Imagery + Digitizing	CH 6: Aerial and Satellite Images
		Lab 6: Orthorectification, digitizing + feature detection	
9		Raster Algebra + Raster Operations	CH 10: Topics in Raster Analysis
		Lab 7: Raster algebra	
10		Terrain Analysis	CH 11: Terrain Analysis
		Lab 8: Terrain analysis	
11		Polygon encapsulation/Spatial Statistics/Point patterns	CH 12: Spatial Estimation: Interpolation, Predication, and Core Area Delineation
		Lab 9: Polygon compactness	
12		Project Pitches	
		Project Pitches	
13		Project In Class Work	
		Project In Class Work	
14		Project Presentations	
		Project Presentations	

At Georgia Tech, final course grades are awarded on a scale of A-F with no +/- grades permitted.

USG Required Course Policies

Attendance and/or Participation

This is an in-person class. Lectures will be in person and will include hands-on lab times to give students more experience with geographic information systems and science. All lectures, readings, assignments are to be accessed through Canvas. Canvas is for general messaging, discussions, and file retrieval.

Since this course is condensed to 3 weeks, attendance is required for each day, with one unexcused absence allowed. Points will be deducted after this absence. Students must be present for project presentations.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Core IMPACTS

Not applicable

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

How to be Successful

Please engage in class. This means showing your fellow students that you are paying attention and that class time and instruction is important to you. Be present in the lectures and do the readings. While slides give key points and high-level topics discussed, much of the content of the course comes through the discussion, and other in-class activities. If you want to do well, attending class is important.

AI Policy

For GIS: All materials turned in should be completed by the student without the use of ChatGPT or another AI tool. This course is designed to be very hands-on, and if you have a question on a lab and you don't know the answer, please ask an instructor or a fellow student. Answers you get from an LLM may not be correct and do not show your critical thinking or abilities, and a wrong answer from you is better than a canned answer from an LLM. **Students who answer lab questions or turn in writing or other materials (e.g., code) that were generated with AI will receive a 0 for the assignment.**

AI can only be used **with explicit permission** (meaning the instructor approved it with you) and for tasks such as data cleaning, graphical design and troubleshooting QGIS (although this is not recommended). Do not use AI to write any PyQGIS code.

Undergraduate Student Academic Success Resources: A list of resources for

undergraduate students' academic success and information about advising can be found at Success at Tech.

Academic Support: Academic Success and Advising (a unit in the Office of Undergraduate Education & Student Success) provides free support for your courses. Students can attend scheduled supplemental review (PLUS) sessions, stop by Drop-In Tutoring, or schedule a one-on-one appointment through Knack. To explore what options work best for you, please visit us online at success.gatech.edu/tutoring, email us at tutoring@gatech.edu, or come see us at Clough Undergraduate Learning Commons, Suite 283.

Graduate Student Academic and Professional Success Resources A list of

resources for graduate students is given on the Office of Graduate and Postdoctoral Education website. Specific information for current graduate students includes:

- Academic Resources such as the Communications Center, Language Institute, Library, Catalog, Registrar, resources for conducting research, Advocacy and Conflict Resolution resources, and how to manage unexpected situations that may impact your academic performance;
- Student Resources such as Campus Services, Child Care/Family programs, Health & Wellness, Career Services, and the Student Resource Guide; and
- Professional Development such as the programming from the Career Center and other professional development resources and events"]

At Georgia Tech, we are concerned about your overall physical, social, and mental well-being. A comprehensive list of wellness related resources has been compiled and maintained by the Office of the Vice President for Student Engagement and Well-being.