GGS 563: Advanced Geographic Information Systems

Updated July 2025

Instructor: Taylor Anderson
Semester: Fall 2025
Time: Wednesday 4:30-7:10, In Person EXPL 2310

This sample syllabus template is compliant with GMU Catalog Policy AP.2.5.

***Important Notice*:** This course will be hosted on Canvas for the Fall 2025 semester. Please ensure you are familiar with accessing and navigating this platform. Resources and support are available at: https://lms.gmu.edu/getting-started-students/ to help you get started. If you have any questions, do not hesitate to reach out to me or contact the ITS Support Center for assistance.

Instructor Contact Information: Contact me by email at tander6@gmu.edu (*George Mason email use is required*). My office hours are Wednesday 11-12pm.

Course Description/Overview:

This project-based course leads students through the design and implementation of spatial decision support systems, considering data management, spatial analysis, and geovisualization. Through three applied projects, students explore how GIS supports complex decision-making across diverse application domains. The course culminates in a student-led showcase, where each student teaches the class about a new GIS method not covered during the semester. Students will gain experience working with various GIS platforms and tools such as ArcGIS Pro, QGIS, PostgreSQL/PostGIS, and R. The course emphasizes critical reflection on the capabilities and limitations of GIS in decision-making contexts.

Course Learning Outcomes:

By the end of this course, students will be able to:

1. Conceptualize and implement spatial decision support workflows that link data, analysis, and visualization techniques applied to real world problems.
2. Design and manage spatial databases to support geospatial projects.
3. Interpret and communicate insights through a variety of formats including maps, reports, posters, and oral presentation.
4. Think critically and communicate the assumptions, uncertainties, and trade-offs inherent in spatial data and analytical methods.
5. Investigate and effectively explain a novel GIS method or technique to an academic audience.

Course Schedule:

Week	Meeting Day	Project Milestones	Deliverables
Suitability Analysis – Demo in ArcGIS Pro			

1	August 27	Data collection and cleaning	
2	September 3	Data transformation with fuzzy membership	
3	September 10	Multi-criteria evaluation	
4	September 17	Cartography Presentations and in-class lightning talks	Presentation slides due September 17 at 4:30pm (before start of class) Final report due September 23 at 11:59pm
Spatial Databases – Demo in PostgreSQL, PostGIS, and QGIS			
5	September 24	Understanding spatial and table joins Conceptual/logical database and example	
6	October 1	Spatial database design and project bidding	
7	October 8	SQL and CRUD	
8	October 15	SQL and spatial queries	Database test Final report due October 21 at 11:59pm
Spatial Regression – Demo in R			
9	October 22	Introduction to R programming, data collection and processing, and descriptive statistics	
10	October 29	Data standardization, spatial autocorrelation, and OLS regression	
11	November 5	GWR and MGWR	Poster due November 7 at 4pm Must be submitted to the library for printing by 4 pm so that its ready for pick up on November 12.
12	November 12	Poster Session	Final report due November 18 at 11:59 pm
Choose Your Own Adventure			
13	**November 19**	Choose Your Own Adventure E.g. Network analysis and accessibility, Interpolation, Change detection, Terrain modeling and surface analysis	
14	**November 26**	**Thanksgiving**	

15	**December 3**	Tools and techniques showcase	Submission of lecture and demo recorded videos and materials on **December 3 at 12pm NOON** (last day of class). NOTE: If the videos exceed the maximum time allotted, you will be asked to re-submit.

Basic Technology Requirements:
This course requires the use of GIS software for assignments and projects including ArcGIS Pro, QGIS, PostgreSQL, and R. Please note that ArcGIS Pro is only available for Windows and does not run natively on Mac. Mac users should plan to either install Windows through Boot Camp or virtualization software (e.g., Parallels) or use QGIS, which is free and cross-platform. Both tools can complete the required coursework.

Helpful technology resources:
ArcGIS System Requirements: https://pro.arcgis.com/en/pro-app/latest/get-started/arcgis-pro-system-requirements.htm
QGIS System Requirements: https://qgis.org/resources/installation-guide/
Run ArcGIS Pro on a Mac: https://pro.arcgis.com/en/pro-app/latest/get-started/run-pro-on-a-mac.htm
R: https://cran.r-project.org/bin/windows/base/
PostgreSQL and pgadmin: https://www.postgresql.org/ https://www.pgadmin.org/

Grading Schema:

GRADE	PERCENTAGE
A+	**96 to 100**
A	**93 to 95.9**
A-	**90 to 92.9**
B+	**86 to 89.9**
B	**83 to 85.9**
B-	**80 to 82.9**
C	**70 to 79.9**
F	**< 70**

GMU does ***not*** have a university-wide grading schema.

Grade Weights:

Database Test	5%
Project 1 Report	20%

Project 1 Lightning Talk	5%
Project 2 Report	20%
Project 3 Report	20%
Project 3 Poster	5%
Project 4 Materials	15%
Participation	10%

Grading-related Policies:

One Extension Policy: Any student may propose a reasonable deadline extension for any course deliverable, subject to my approval, once during the semester. Students must justify in writing why they need this extension and provide a plan for how they will complete the work prior to the submission deadline.

One Revision Policy: Any student may revise and resubmit one major project deliverable within two weeks, after it is graded, either for a new grade or for up to a 15% increase on their prior grade provided the revisions are significant (not just error corrections).

Late Assignment Deduction Policy: Any late deliverable will earn a flat 10% grade deduction as long as the deliverable is completed within 7 days of the deadline. If it is not completed within 7 days of the deadline, the student will receive a 0.

Other Course Policies:

Team Project Responsibilities: Effective teamwork is essential for successful group projects. Each team member is expected to contribute actively, communicate regularly, and respect deadlines. Responsibilities should be clearly divided based on each member's strengths and agreed upon early in the process. Team members are accountable not only for their individual tasks but also for supporting the overall goals of the group. Collaboration, transparency, and mutual respect are key to ensuring a productive and fair working environment. Each team member on a group project will submit a "**Peer Evaluation Form for Group Projects**".

Scheduling Conflicts: Conflicts with course schedule (unless unforeseeable) must be communicated with the instructor 48h in advance. The student and the instructor will work together to find solutions to conflicts.

Campus Closure or Disruptions: If the campus closes, or if a class meeting needs to be canceled or adjusted due to weather or other concern, students should check Canvas for updates on how to continue learning and for information about any changes to events or assignments.

Instructor-Student Communication: The instructor will respond to your emails within 48 hours. If the instructor is away from email for more than two days, the instructor will post an announcement in the Canvas course folder. Before sending an email, please check Canvas unless the email is of a personal nature.

Generative AI: Use of Generative-AI tools should be used following the fundamental principles of the Honor Code. This includes being honest about the use of these tools for submitted work

and including citations when using the work of others, whether individual people or Generative-AI tools.

Students may use Generative AI tools whenever they believe it would be useful to their learning of course material. Students will be directed if and when citation or a statement-of-usage is required. All academic integrity violations will be reported to the office of Academic Integrity.

Student work will not be submitted through originality detection software focused on AI tools because the utilization of these types of tools is expected. Although you are unrestricted with your use of Generative AI tools, you will be responsible for any incorrect, biased, or unethical information that is submitted, and your assignment grade will reflect the inclusion of any material that is incorrect or offensive.

Course Materials: All course materials posted to Canvas or other course site are private to this class; by federal law, any materials that identify specific students (via their name, voice, or image) must not be shared with anyone not enrolled in this class.

Video recordings — whether made by instructors or students — of class meetings that include audio, visual, or textual information from other students are private and must not be shared outside the class.

Live video conference meetings (e.g. Collaborate or Zoom) that include audio, textual, or visual information from other students must be viewed privately and not shared with others in your household or recorded and shared outside the class

Common Policies Addendum: These four policies affect students as outlined in the **Common Policies Addendum**.