Master Course Syllabus

For additional course information, including prerequisites, corequisites, and course fees, please refer to the Catalog: https://catalog.uvu.edu/

Semester: Spring
Year: 2025
Course Prefix: GEOG
Course and Section #: 3650-001
Course Title: Advanced GIS
Credits: 4

Course Description

This class is designed to develop geospatial analysis experience building upon concepts learned in the Introduction to Geographic Information Systems (GEOG 3600) course. We will also learn and apply new GIS-based tools and analyses bridging ESRI's ArcGIS and other software programs. Many applications will be using raster datasets to analyze the Earth. The course is designed to be 25-40% lecture + Discussion and 60-75% application.

Specific concepts that will be covered include:

1. Data Sources, Metadata, Coordinate Systems and Datums (review +)
2. Interpolation of Surfaces (point to raster), comparing raster surfaces (raster math and profiles)
3. Tracking Uncertainty, Error, Accuracy, Precision, and Fit through geospatial data.
4. Raster Math for Manipulating Datasets and Calculating Landscape Change.
5. 3D Analyst Tools and Applications for Route Locations, Extracting Raster Data for Features.
6. ArcHydro Tools and Model Builder in ArcGIS.
7. Geostatistical Tools (e.g., Zonal Statistics) for Global Analyses, PCA, and Classification.
8. Use of Toolbox add-ons, Batch Processing, Model Builder, and Python Scripting in ArcGIS.
9. Cartography and the presentation of Quantitative and Qualitative Data.
10. Introduction to Additional, Other, Open-Source, GIS Software Platforms.

Course Attributes

This course has the following attributes:

☐ General Education Requirements
☐ Global/Intercultural Graduation Requirements
☐ Writing Enriched Graduation Requirements
☒ Discipline Core Requirements in Program
☒ Elective Core Requirements in Program
☒ Open Elective
Other: *Click here to enter text.*

Instructor Information

Instructor Name: Dr. Nathan Toké

Student Learning Outcomes

Table 1. Course objectives: upon successful completion, students should be able to:

1 -	Apply modeling and analysis skills in spatial analyst and 3-D analyst extensions;
2 -	Apply GIS knowledge to spatial problems;
3 -	Obtain and import into GIS software digital data, including data for use in a research project;
4 -	Develop and implement a research project using GIS;
5 -	Describe and explain at an advanced level the theory and application of GIS.

Table 2. Upon successful completion, students should have the following attitude(s)/traits:

1 -	Conduct GIS spatial, geostatistical, and 3-D analysis functions;
2 -	Utilize GIS as a problem-solving tool;
3 -	Have the confidence and ability to find new techniques and solutions.

Course Materials and Texts

Textbook: Paul Bolstad and Steven Manson, GIS Fundamentals: A First Text on GIS, Sixth (2019) or Seventh (2024) Edition. *Note that this was the same textbook as was required for introduction to GIS.*

Peer-reviewed journal articles will be assigned for each of our five journal assignments on canvas.

Course Requirements

Course Assignments, Assessments, and Grading Policy
Grades are based upon the following assessment activities:

Reading Journals and Class Discussions (20%): For class discussions to be productive and it requires that we read the material prior to class. The readings will be from journal articles about GIS and remote sensing. Each week all students will be responsible for participating in our exploration into these new GIS topics.

In Class Assignments and Content Labs (50%): Nearly every other week for the first 2/3 of the semester there will be a lab activity to complete and turn in forming the majority of the assessment for this class. There will also be frequent attendance warm up activity quizzes at the start of class.

Group and Individual Projects (30%): The individual projects will commence following the submission of a written project proposal submitted before spring break. The projects' final products can vary based upon the proposed work but will include a final report describing your GIS methodology and project outcomes in detail. Examples of suitable products described in the report would be: a storymap or webpage documenting a the geospatial analysis that you've produced, a poster for future presentation at a professional conference with an accompanying methodology report, a large format mapping product for publication and an accompanying report, a draft of a paper for publication in a professional journal based upon your spatial analyses, or a report prepared for a real-world client.

Due Dates and Late Work Statement: Journals and Labs will have due dates listed on canvas, they will not close (i.e., I want you to complete all the journals over the semester). Assignments that come in after I have graded them as a class will receive a 5% late penalty. Assignments that are more than 1 week late will receive a 20% late penalty. Warm Up Activities are like pop quizzes that check attendance. They cannot be made up. I will drop the lowest two of these activities (insurance for unforeseen issues with getting to class on time).

Grading

94-100% =	A	(demonstrates a mastery! of the learning objectives)
90-93.9%=	A-	
87-89.9%=	B+	
84-86.9%=	B	(demonstrates a functional level of the learning objectives)
80-83.9%=	B-	
77-79.9%=	C+	
74-76.9%=	C	(demonstrates basic achievement of learning objectives)
70-73.9%=	C-	
67-69.9%=	D+	
64-66.9%=	D	(met some learning objectives, has significant deficits)
60-63.9%=	D-	
0-60%=	E	(failure to demonstrate an understanding of learning objectives)

Required or Recommended Reading Assignments

Specific readings (articles and textbook sections) are posted within each journal assignment on canvas.

General Description of the Subject Matter of Each Lecture or Discussion

*Click here to enter text.*Daily Course Schedule

Week of	Topics	Assignments Plan
1-(Jan 7/9)	*Data Sources and Interpolation of Digital Surfaces (i.e., DEMs). Precision v. Accuracy*	**Journal 1**
2-Jan 14/16)	*Continued from Week 1*	**Activity 1**
3-(Jan 21/23)	*Topographic data analyses, differencing/ raster math.*	**Journal 2**
4-(Jan 28/Jan 30)	*Cartography, 3D Analyst Tools and Applications for Route Locations. Arc Hydrotools.*	**Activity 2**
5-(Feb 4/5)	*Interoperability between Raster and Feature Data*	**Journal 3**
6-(Feb 11/13)	*FEB 11th will be open lab hours, Dr. Toke at UGS Conference.* *Census Data Downloading, Building Tables, and Analysis*	**Activity 3**
7-(Feb 18/20)	*Geostatistical Tools in ArcGIS for Global Analyses, PCA, and Classification.*	**Journal 4**
8-(Feb 25/ 27)	*Continued from weeks 6-7*	**Activity 4**
9-(Mar 4/6)	*Project Design and Workflow*	**Project Proposals**
March 10-15th	***Spring Break***	
10-(March 18/20)	*Custom Scripts for Analyzing Data in ArcGIS.*	**Journal 5**
11-(March 25/27)	*Continued from week 10*	**Activity 5**
12-(April 1/3)	*Term Projects*	**Project Notes Week 1**

13-(April 8/10)	*Term Projects*	**Project Notes Week 2**
14-(April 15/17)	*Term Projects*	**Methods Section Submitted**
15-(April 22/)	*Term Projects*	**Presentations**
16-(April 29th, 7am)	*Final Presentation in lieu of exam.*	**Presentations and Papers Due**

Required Course Syllabus Statements

Generative AI

This course requires you to complete assignments that assess your understanding, application, and problem-solving ability applied to geology and physical science. You are expected to do your own work. Problem solving and scientific thinking are tools that are necessary for students to learn in this course. The use of artificial intelligence (AI) tools, such as chatbots, text generators, paraphrasers, summarizers, or solvers, is only permitted to help students gain an understanding of content. Copying AI outputs or any sources will be treated as any other form of plagiarism (academic dishonesty) and will be handled according to the university's academic honesty policy. Instead, you can use AI like you would a textbook or internet search, to help you gain understanding of a subject. ***Use AI sparingly because it is an extremely energy and water intensive cloud-based software tool. Every time you use it; it costs about 1 liter of water and significant energy resources.*** After you've read and consulted with other sources (textbook, class notes, etc.) then write a response to journal and quiz questions that is your own original language. Please also note that AI hallucinates and often feeds students incorrect information, especially in subjects like this one. It is easy to spot AI responses because of their overly detailed examples with interspersed hallucinations. Note that for this class, assignments that are determined to be plagiarized will receive a zero and warning for the first offense. The second offense will result in negative points, and I will report you to the administration for academic dishonesty. A third offense may result in immediate failure of the course. If you have questions about acceptable use of AI tools, please consult the instructor before submitting your work.

Using Remote Testing Software

☒ This course does not use remote testing software.

☐ This course uses remote testing software. Remote test-takers may choose their remote testing locations. Please note, however, that the testing software used for this may conduct a brief scan of remote test-takers' immediate surroundings, may require use of a webcam while taking an exam, may require the microphone be on while taking an exam, or may require other practices to confirm academic honesty. Test-takers therefore shall have no expectation of privacy in their test-taking location during, or immediately preceding, remote testing. If a student strongly objects to using test-taking software, the student should contact the instructor at the beginning of the semester to determine whether alternative testing arrangements are feasible. Alternatives are not guaranteed.

Required University Syllabus Statements

Accommodations/Students with Disabilities

Students needing accommodations due to a permanent or temporary disability, pregnancy or pregnancy-related conditions may contact UVU Accessibility Services at accessibilityservices@uvu.edu or 801-863-8747.

Accessibility Services is located on the Orem Campus in BA 110.

Deaf/Hard of Hearing students requesting ASL interpreters or transcribers can contact Accessibility Services to set up accommodations. Deaf/Hard of Hearing services can be contacted at DHHservices@uvu.edu

DHH is located on the Orem Campus in BA 112.

Academic Integrity

At Utah Valley University, faculty and students operate in an atmosphere of mutual trust. Maintaining an atmosphere of academic integrity allows for free exchange of ideas and enables all members of the community to achieve their highest potential. Our goal is to foster an intellectual atmosphere that produces scholars of integrity and imaginative thought. In all academic work, the ideas and contributions of others must be appropriately acknowledged and UVU students are expected to produce their own original academic work.

Faculty and students share the responsibility of ensuring the honesty and fairness of the intellectual environment at UVU. Students have a responsibility to promote academic integrity at the university by not participating in or facilitating others' participation in any act of academic dishonesty. As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, assessments, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Likewise, instructors are responsible to clearly state expectations and model best practices.

Further information on what constitutes academic dishonesty is detailed in UVU Policy 541: *Student Code of Conduct*.

Equity and Title IX

Utah Valley University does not discriminate on the basis of race, color, religion, national origin, sex, sexual orientation, gender identity, gender expression, age (40 and over), disability, veteran status, pregnancy, childbirth, or pregnancy-related conditions, citizenship, genetic information, or other basis protected by applicable law, including Title IX and 34 C.F.R. Part 106, in employment, treatment, admission, access to educational programs and activities, or other University benefits or services. Inquiries about nondiscrimination at UVU may be directed to the U.S. Department of Education's Office for Civil Rights or UVU's Title IX Coordinator at 801-863-7999 – TitleIX@uvu.edu – 800 W University Pkwy, Orem, 84058, Suite BA 203.

Religious Accommodation

UVU values and acknowledges the array of worldviews, faiths, and religions represented in our student body, and as such provides supportive accommodations for students. Religious belief or conscience broadly includes religious, non-religious, theistic, or non-theistic moral or ethical beliefs as well as participation in religious holidays, observances, or activities. Accommodations may include scheduling or due-date modifications or make-up assignments for missed class work.
To seek a religious accommodation, a student must provide written notice to the instructor and the Director of Accessibility Services at accessibilityservices@uvu.edu. If the accommodation relates to a scheduling conflict, the notice should include the date, time, and brief description of the difficulty posed

by the conflict. Such requests should be made as soon as the student is aware of the prospective scheduling conflict.

While religious expression is welcome throughout campus, UVU also has a specially dedicated space for meditation, prayer, reflection, or other forms of religious expression.