Geography 3650: Advanced Geographic Information Systems

Section 001 Lecture/Lab: M/W, 12-2:30, SB 175

Contact information

The Canvas' email system will reach me and is the preferred method of contact outside of office hours. **I will reply to your emails within 48 hours except weekends and holidays.**

Instructor:	**Dr. Weihong Wang**
Email:	Please use Canvas email to reach me
Office Location:	PS 213
Office Hours:	MW 10:00 to NOON or by appointment
Office Phone:	801-863-7607
Pre-requisites:	GEOG 3600 or GIS 2640, and University Advanced Standing
Texts:	**1 - Required Readings Assigned and Posted to Canvas and From: http://www.spatialanalysisonline.com/HTML/index.html** **2 – Supplemental (Not Required):** *Paul Bolstad, 2015.* ***GIS Fundamentals: A First Text on Geographic Information Systems, Fourth Edition***

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 between ESRI's ArcGIS and other software programs. Many applications will be using raster datasets to analyze the Earth. The course is design to be 25-40% lecture + Discussion and 60-75% application.

Specific concepts that will be covered include:

1. Data Sources and Interpolation of Digital Surfaces (i.e., DEMs) using GIS.
2. Tracking Uncertainty, Error, Accuracy, Precision, and Fit through geospatial data.
3. 3D Analyst Tools and Applications for Route Locations, Extracting Raster Data for Features.
4. Raster Math for Manipulating Datasets and Calculating Landscape Change.
5. Geostatistical Tools in ArcGIS for Global Analyses, PCA, and Classification.
6. ArcHydro Tools and Model Builder in ArcGIS.
7. Use of Toolbox add-ons and Python Scripting in ArcGIS.
8. Other Custom Scripts for Analyzing Data in ArcGIS.

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

Attendance

Arrive on time so we can start promptly. Attendance is necessary for learning. You are paying for this course, so come to class prepared to engage with your classmates and me.

Classroom Etiquette
Be respectful of each other and your instructor. Turn off cell phone ringers; don't be obnoxious or offensive to others. Snacks and drinks are not allowed at the workstations in the computer lab.

University Policies
All university policies, student rights, and responsibilities codes are enforced, including no tolerance for plagiarism and other forms of cheating. Violations may result in a failing grade for that assignment or for the class. Refer to the following policies and procedures document:
https://www.uvu.edu/policies/manual.html

Student Accommodations
Students who need accommodations because of a disability may contact the UVU Accessibility Services Department (ASD), located on the Orem Campus in LC 312. To schedule an appointment or to speak with a counselor, call the ASD office at 801-863-8747. Deaf/Hard of Hearing individuals, email nicole.hemmingsen@uvu.edu or text 385-208-2677.

Expected Effort
In this class you will continue to develop a valuable and marketable skill. GIS can be really fun and this class will be, but it will also be demanding of your time. A general rule of thumb is that for each course credit hour you should expect to double the number of hours outside of class studying to succeed (B or A) in that course. This is a 4 credit hour class. Therefore you should expect 8 hours of homework per week on average (i.e., readings and journals [2-4 hrs], completing labs and projects [4-6hrs]. Some weeks will have less homework and some weeks will have more.

Grading

93.5-100% =	A	(Demonstrated a *mastery* of the learning objectives)
90-92.9%=	A-	
87-89.9%=	B+	
83-86.9%=	B	(Demonstrated a *functional level* of the learning objectives and *very few deficits*)
80-82.9%=	B-	
77-79.9%=	C+	
73-76.9%=	C	(Demonstrated *basic achievement* of learning objectives with *minor deficits*)
70-72.9%=	C-	
67-69.9%=	D+	
63-66.9%=	D	(met some learning objectives, but also demonstrated *significant deficits*)
60-62.9%=	D-	
0-59.9%=	E	(*Didn't meet learning objectives and/or failure to participate regularly*)

Grades are based upon

20%	In-class Assignments and Note Taking
25%	Readings and Journals
25%	Content Labs
10%	Poster and Poster Presentation
20%	Project Term Paper

- **Class assignments and notes (20%):** This class will have some short activities; towards the end of class much of the lab work will be working toward your projects' goals. You will be graded on weekly participation in this work. The minimum evidence will be the submission of digital notes. There will be an entry for nearly every day.
- **Reading Journals and Class Discussions (25%):** For class discussions to be productive and it requires that we read the material prior to class, and journals are due at 12:00 on Mondays. In

addition, every student will lead one class discussion. 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.

- **Content Labs (25%):** Nearly every week for the first 2/3 of the semester there will be a lab activity to complete and turn in. These assignments will be due by Friday at 5 pm of the week they are assigned.
- **Poster and Poster Presentation (10%):** Each student will make a 3′x4′ poster on your project and present it to the class. The presentation will be 8 minutes long and 2 minutes for questions. Your poster and poster presentation will be graded by both me and your peer classmates.
- **Project Term Paper (20%):** 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 technical report. Examples of suitable products described in the report would be: a webpage documenting a the geospatial analysis that you've produced, a poster for future presentation at a professional conference with an accompanying 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.

- ***Writing Submission Standards*** *– In this class I expect written documents to be turned in via .docx, .doc, or .pdf formats on CANVAS. Font sizes should range from 11-12 pt. Acceptable fonts include Times New Roman, Calibri, Arial and similarly-sized legible fonts. Line spacing should be 1.5, all references should be appropriately cited: i.e., at the end of a sentence that requires reference include: (Author, YEAR) or (Author 1 et al., YEAR) and at the end of your paper include an alphabetical citation list with each entry formatted in the same manner and including: Authors, Year, Title, Journal, Volume/Number, Pages. For detailed recommendations please see the Council of Science Editors: http://library.osu.edu/find/resources/citation-examples/cse/cse-style-guide-articles/*

- ***Figure Submission Standards*** *– Most figures in this class will be maps. Generally, most maps/figures should include: North Arrow, Scale Bar, Explanation of Symbols (key), Figure Caption, and Author's Name. It is preferred, for your own sanity that you separate figure captions (word document file) from figures which should be presented in PDF format. Name any files you create in this class so that I can attribute the file to you (i.e., Wang_Lab1.pdf).*

SEE TENTATIVE SCHEDULE ON NEXT PAGE

Tentative Course Schedule (subject to changes)

Week of	Topics	Monday Plan	Wednesday Plan
1-(Jan 8/12)	*Review section*	Syllabus and Vector Analysis Review	*Raster Analysis Review*
2-(Jan 15/19)	*Data Sources and Interpolation of Digital Surfaces (i.e., DEMs)*	**No Class MLK Day**	**Lab Work**
3-(Jan 22/26)	*Continued from Week 2*	**Journal 1 Due**	*Discussion 1*
4-(Jan 29/Feb 2)	*Tracking Uncertainty, Error, Accuracy, Precision, and Fit in geospatial data.*	**Journal 2 Due**	*Discussion 2*
5-(Feb 5/9)	*3D Analyst Tools and Applications for Route Locations, Extracting Raster Data to Features.*	**Journal 3 Due**	*Discussion 3*
6-(Feb 12/16)	*Raster Math for Manipulating Datasets and Calculating Landscape Change.*	**Journal 4 Due**	*Discussion 4*
7-(Feb 19/23)	*Geostatistical Tools in ArcGIS for Global Analyses, PCA, and Classification.*	**No Class, President's Day**	**Lab Work**
8-(Feb 26/Mar 2)	*Continued from Week 7*	**Journal 5 Due**	*Discussion 5*
9-(Mar 5/9)	*ArcHydro Tools and Model Builder in ArcGIS*	*:* **Journal 6 Due**	*Discussion 6*
10-(March 12/16)	*Use of Toolbox add-ons and Python Scripting in ArcGIS.*	**Journal 7 Due**	**Project Proposal Due** *Discussion 7*
11-(March 19/23)	**SPRING BREAK NO CLASS**		
12-(March 26/30)	Project	**Journal 8 Due**	*Discussion 8*
13-(April 2/6)	Project	**Project Notes 1**	**Project Notes 2**
14-(April 9/13)	Project	**Project Notes 3**	**Project Notes 4**
15-(April 16/20)	Project	**Project Notes 5**	**Project Notes 6**
16-(April 23/27)	Project		**Project Draft Due**
17-(April 30)	*Project Presentation*		**Project Term Paper Due**

Italics = student preparation task (preparation for that day); Regular = in-class activity
Bold = **Graded Assignment is Due**; Yellow highlight = no class that day