

Advanced Techniques in GIS (GEOG 422/822)

University of Nebraska-Lincoln
College of Arts and Sciences
School of Global Integrative Studies
Program of Geography
Spring 2020

Class meetings

Room: Burnett 126
Lecture: MWF 1:30-2:20
Lab: F 12:30-1:20

Instructor

Dr. Patrick Bitterman
Office: 932 Oldfather Hall
Email: patrick.bitterman@unl.edu
Phone: 402.472.7078
Office Hours: Mondays and Wednesdays, 2:30 – 3:30pm

Department Chair

Dr. Sophia Perdikaris
Office: 815 Oldfather Hall
Email: sperdikaris2@unl.edu
Phone: 402.472.2114

Course description

The use of geographic information system (GIS) software for the management and analysis of social and environmental systems is rapidly expanding in both depth and breadth. Simultaneously, the underlying technology continues to evolve – presenting new challenges to the GIS user community. To apply GIS technology appropriately and ethically, users must have a solid foundational understanding of the basic principles that underlie GIS software and Geographic Information Science (GIScience). In this course, students will develop a solid understanding of advanced theories and analytical methods in GIScience. Students will also strengthen their GIS skills through hands-on labs, exercises, and course projects, and will develop the skills necessary to use leading GIS software packages properly.

Learning objectives

By the end of the term, students will be able to successfully:

- Critically evaluate established and contemporary GIScience and spatial analysis literature
- Synthesize concepts of GIS theory, methodology, and application
- Demonstrate a conceptual and working knowledge of GIS and spatial analysis operations
- Individually identify a research question, formulate an analysis plan, and complete that analysis using GIS and spatial analysis tools
- Understand how alternative methods can determine outcomes and affect decision-making

Prerequisites

Students are expected to have completed GEOG 412/812: Introduction to GIS or similar

Required materials

Principles of Geographical Information Systems Third Edition. 2015. Burrough, P, McDonnell, Rachel A, Lloyd, Christopher D. Oxford University Press. Available at UNL Bookstore and online

All other assigned readings will be distributed via Canvas.

Course policies

Class format

Primary instruction will take place in a hybrid lecture-lab format. Weekly lab assignments will provide students with the opportunity to demonstrate their work in a practical setting.

Late work

Unless otherwise noted:

- all assignments are due on the specified due date
- late items will be accepted, but will be penalized 20% of the potential points for each day that they are late.

Changes to the syllabus

Any changes to the syllabus will be communicated via email and posted on the Canvas course page.

Working in the Lab

You are free to work in the lab whenever it is open and there is not another class using the lab. Be respectful of other classes. Students enrolled as of 1/13/2020 have access to the Lab using their NCard. If you need access, please let me know immediately. Students have access to the room when the building is open, and no classes are meeting. Students working in the room may stay past the closing of the building but should remain aware and alert.

Room availability outside of classes scheduled (subject to change):

Monday	TBD
Tuesday	TBD
Wednesday	TBD
Thursday	TBD
Friday	TBD

Digital file storage on lab computers should always be considered temporary. Students are encouraged to save each lab in a separate directory (e.g., “lab_03”) on either UNL Box Sync or a USB drive. ***YOU ARE ALWAYS RESPONSIBLE FOR YOUR DATA!*** Make backups as necessary..

Collaboration

While you may choose to interact with other students on laboratory assignments and the final project, all submitted work is expected to be your own. All write-ups, discussion statements, and other work should be your own, individual thoughts. Your maps and project should also reflect work that is independent and unique to you.

Students who do not follow these policies will be reported to the College for academic dishonesty. If you have questions regarding this policy, it is your responsibility to ask them.

Your Responsibilities

You have a responsibility to help create a classroom environment where all may learn. At the most basic level, this means you will respect the other members of the class and the instructor and you will treat them with the courtesy you expect to receive in return. This policy applies to all forms of communication in this course. Any email correspondence will be conducted via your UNL email address.

Miscellany

Be honest and have integrity in your work. For example, do not increase the perceived length of a lab report by increasing the size of punctuation or manipulating spacing. Be kind and be polite. Finally, you will get out of this class what you put into it – be prepared, participate, and be attentive, and you will be successful.

Preparing for lab and lecture

Using the GIS Lab and Software (ArcGIS Pro)

ArcGIS Pro, one of the software packages you will interact with, is available to you in the GIS Lab (Burnett 126). We are currently inquiring with ESRI regarding off-campus student licenses. You may also purchase a license at your own expense. Please note, ArcGIS only runs on the Windows operating system.

Other tips

- Read relevant materials before the lecture.
- If there are topics you would like to hear more about, please bring share your ideas to make the class more relatable and interesting.
- Read the entire lab document *before* you attempt the lab assignment.
- Take advantage of office hours.
- Post questions to the appropriate Canvas forum.
- Take breaks.
- Do not leave assignments until the last minute.

Assessment

Lab assignments (42%)

There are seven required lab assignments. Labs will become more complicated and include less guided instruction as the semester progresses. Each lab assignment will have a corresponding Canvas Discussion Board where you can post (and respond) to questions. ***Please use the discussion board to attempt and answer your questions about lab assignments prior to emailing your instructor.*** Using the discussion board will ensure that all students will benefit from the questions and their responses. You may work on labs at any time. A weekly schedule for the lab will be posted on Canvas. Feel free to work on labs elsewhere if you have access to the necessary software and are comfortable working independently. Lab assignments are to be completed at your own pace, but they must be submitted prior to the due date. The due date for each assignment is included in the instructions.

All completed lab assignments must be submitted to the course Canvas site. No other submissions will be accepted.

Exams (30%)

One mid-term exam and one final exam will be given during the semester. The mid-term will occur during a regularly scheduled class session.

Final Project (28%)

The final project is a chance for you to apply your skills to an area of your interest. You may collaborate with a classmate on this project. The final project is a required component of the course. You must submit this assignment to pass the course regardless of your other assignments such as exams and labs.

Additional documents explicitly defining the guidelines and milestones of the project, and example projects will be shared. Final project has four milestones. The first milestone is the submission of the final project proposal and data. You must submit both your preliminary data and written proposal. The second milestone is a brief update presentation to the class on the status of your work. The third milestone will include the final project outcome which consist of your analysis and write-up describing your project. The final milestone is an in-class presentation.

There will be a series of final project workshops throughout the semester to provide you the rubric and expectation for the final project proposal, data, and final project deliverables. As a part of the final project workshops, in the last lab session, you will receive feedback on your final project and have some time left to make necessary revisions before submitting the final project.

Enrollees of 832 (Graduate Students)

For those students enrolled in GEOG 832, the requirements of the final project will be expanded to include an additional 3-4 pages in your report. Your project must be completed individually.

All assignments should be submitted to the corresponding Canvas assignment before the due date.

Evaluation scale

Grade	Minimum % of Points	Grade	Minimum % of Points	Grade	Minimum % of Points	Grade	Minimum % of Points
A	94	B+	87	C+	77	D+	67
A-	90	B	84	C	74	D	64
		B-	80	C-	70	D-	60
						F	Below 60

Grades will be based on the following:

Assessment	Total points
Lab assignments (6 labs x 60 points each)	360
Midterm exam (take home)	150
Final exam (compensatory)	50
Final project	
~Project proposal	50
~In-class update presentation	30
~Project report	150
~Project poster	50
Total	840

Extra credit

Extra credit assignments and opportunities will not be offered.

Important dates

Project proposal due	February 14
Project in-class updates	March 6
Midterm exam	March 11
Final project write-up due	May 1

Tentative course schedule

Week	Date	Topic
1	1/13	Introduction and review Chapters 1 & 2
2	1/20	Review and raster datasets Chapters 3 & 4
3	1/27	Digital elevation models and terrain Chapters 10 & 11
4	2/3	Hydrological analyses and course projects
5	2/10	Raster datasets and map algebra Canvas readings
6	2/17	Vector data sets, suitability analyses, and multi-criteria analyses Chapter 7
7	2/24	Database management systems Chapter 4
8	3/2	Automation and programming Canvas readings
9	3/9	Review MIDTERM EXAM
10	3/16	Class canceled due to COVID-19 pandemic and university responses
11	3/23	SPRING BREAK
12	3/30	Interpolation and density functions Chapter 8 & 9, Canvas readings
13	4/6	Spatial analysis Chapters 6 & 7
14	4/13	GIS applications: environmental justice and social vulnerability Canvas readings
15	4/20	Uncertainty and error Chapter 13
16	4/27	Project work
Finals	5/4	Posters and papers due 5/4

All (non-textbook) required and optional readings, and assignments can be found on Canvas. Check Canvas!

University policies

Accommodations

Students with disabilities are encouraged to contact the instructor for a confidential discussion of their individual needs for academic accommodation. It is the policy of the University of Nebraska-Lincoln to provide flexible and individualized accommodation to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with the Services for Students with Disabilities (SSD) office, 132 Canfield Administration, 472-3787 voice or TTY.

Academic Dishonesty

Academic honesty is essential to the existence of an academic institution. The responsibility for maintaining that integrity is shared by all members of the academic community. The University's [Student Code of Conduct](#) addresses academic dishonesty. Students who commit acts of academic dishonesty are subject to disciplinary action and are granted due process and the right to appeal any decision. In this course, unintentional plagiarism is still considered plagiarism. It is essential that you properly cite your sources.

Academic Support Services

You can schedule free appointments for individual academic coaching with First-Year Experience and Transition Program staff through MyPLAN. You can also take advantage of study stops--which provide individual and group study with learning consultants in a variety of disciplines--and free group workshops on topics such as time management, goal setting, test preparation, and reading strategies. See success.unl.edu for schedules and more information.

Counseling and Psychological Services

UNL offers a variety of options to students to aid them in dealing with stress and adversity. [Counseling and Psychological & Services \(CAPS\)](#); is a multidisciplinary team of psychologists and counselors that works collaboratively with Nebraska students to help them explore their feelings and thoughts and learn helpful ways to improve their mental, psychological and emotional well-being when issues arise. CAPS can be reached by calling 402-472-7450. [Big Red Resilience & Well-Being \(BRRWB\)](#) provides one-on-one well-being coaching to any student who wants to enhance their well-being. Trained well-being coaches help students create and be grateful for positive experiences, practice resilience and self-compassion, and find support as they need it. BRRWB can be reached by calling 402-472-8770.

Diversity and Inclusion

The University of Nebraska-Lincoln does not discriminate on the basis of race, ethnicity, color, national origin, sex (including pregnancy), religion, age, disability, sexual orientation, gender identity, genetic information, veteran status, marital status, and/or political affiliation.

Revision history

2020-03-21: large rework due to COVID-19 pandemic and university response