

Principles of GIS (GEOG 217)

University of Nebraska-Lincoln
College of Arts and Sciences
School of Global Integrative Studies
Fall 2020

Class meetings

Lecture (see separate COVID-19 lecture policy):

Asynchronously online *and*

9:30-10:45am: 102 Love Library South (LLS 102)

Lab: 126 Burnett Hall

Instructor

Dr. Patrick Bitterman

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Office Hours: *via Zoom* Tuesdays, 11am-12pm or by appointment

Teaching Assistant

Morgan Ryan

See lab syllabus for details

Department Chair

Dr. Sophia Perdikaris

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Course description

The purpose of this course is to introduce the theories and methods of Geographic Information Science (GIScience) and Geographic Information Systems (GISystems). The lectures will provide spatial thinking and analysis skills, as well as the fundamental basic knowledge and theory needed to use GISystems effectively, accurately, and ethically. The topics covered in this course will include, but are not limited to, geodesy, cartography and geovisualization, map projections, geospatial data collection, GPS, spatial data models, spatial databases, and spatial analysis. The course also includes lectures weekly lab sessions. Labs build on the concepts learned in lecture by applying increasingly complex geoprocessing techniques, and offer you opportunities to familiarize yourself with the software while interacting with other students. You should expect to spend an additional 2-6 hours of effort outside class time to complete associated readings and lab assignments.

Learning objectives

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

- demonstrate a practical understanding of GIS concepts, techniques, and real-world applications
- communicate using the technical language of GIS

- operate desktop and web-based GIS software
- store, manage, and retrieve data in a variety of geospatial and tabular formats
- compare and contrast the vector and raster data models
- formulate a workflow to solve a natural resource management problem by utilizing appropriate GIS methods
- create geospatial data using digitizing and geocoding methods
- produce presentation-quality maps and web applications to communicate spatial information

Required materials

Bolstad. 2019. *GIS Fundamentals: A First Text on Geographic Information Systems (6th edition)*. XanEdu Press. Available at UNL Bookstore.

Course policies

Class format

Primary instruction will take place in lecture and group discussion. Weekly lab assignments will provide students with the opportunity to demonstrate their work in a practical setting. Each lab will have a corresponding Canvas discussion board, where students can post any questions or issues they encounter. These discussion boards will serve as an additional opportunity to interact with your classmates.

Attendance

In-person attendance is expected but not required.

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

Due to the COVID-19 pandemic, access to the GIS Lab will be restricted. See the Lab Syllabus for additional details. **Remote access to lab computers will also be provided.** Students will have access to the Lab using their NCard. If you need access, please let me know immediately.

Collaboration

In this class, students are not allowed to collaborate with others on any exam. Do not share your work with others or ask others to see their work.

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 must 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, the primary software used in this course, is available to you in the GIS Lab (Burnett 126). You may purchase a student license at your own expense, but this is not required. Please note that ArcGIS Pro only runs on the Windows operating system.

Other tips

- Read relevant materials before the lecture.
- Attend lectures. Understanding the theory and history of geospatial analysis is the best way to excel at troubleshooting issues and to devise efficient workflows. If your goal is to point and click your way through this class, it is unlikely that you will enjoy yourself or the end result.
- 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 (50%)

There are ten required lab assignments and one optional lab assignment. Labs will become more complicated and include less guided instruction as the semester progresses. Instructions and data supplied for lab assignments will be available via Canvas. 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 to the Lab section page 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.

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. The final examination date and time are included in the course schedule below. It is your responsibility to know the date, time, and place of the final exam. Each exam is 15% of your final grade.

Final Project (20%)

The final project is a chance for you to apply your new GIS skills to an area of your interest. 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 two milestones. The first milestone is the submission of the final project proposal and data. You must submit both your data and proposal to receive 5% of your final grade. The second milestone will include the final project outcome which consist of your map(s), spatial analysis and write-up describing your project. The final project outcome corresponds to 15% of your final grade. 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.

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

Evaluation scale

Grade	% of Points	Grade	% of Points	Grade	% of Points	Grade	% of Points
A+	99-100	B+	87-89	C+	77-79	D+	67-69
A	94-98	B	84-86	C	74-76	D	64-66
A-	90-93	B-	80-83	C-	70-73	D-	60-63
						F	Below 60

Grades will be based on the following:

Assessment	Total points
Lab assignments (10 x 50 points/each)	500
Mid-term exam	150
Final exam	150
Final project	200
Total	1000

Extra credit

Extra credit assignments and opportunities will not be offered.

Tentative Course Schedule

Week	Date	Topic	Readings
1	8/17	Course introduction Introduction to Geographic Information Systems Lab 01: Spatial reasoning and intro to ArcMap	Ch. 1
2	8/24	Map Design and Elements Principles of symbolization Lab 02: Thematic Mapping	Ch. 4, Canvas
3	8/31	Map types Data classification Lab 03: Data retrieval, classification, comparison	Canvas
4	9/7	Geodetics Map projections Lab: final project workshop	Ch. 3
5	9/14	Map projections Coordinate systems Lab 04: Projections	Ch. 3
6	9/21	Data sources & input & error Lab 05: Digitizing	Ch. 4, 7, 14
7	9/28	Raster data model Midterm examination: in class Lab: final project workshop	Ch. 2
8	10/5	Vector data model Lab 06: Georectification	Ch. 2
9	10/12	Introduction to GNSS & GPS Lab 07: Geocoding	Ch. 5
10	10/19	Remote sensing Lab: final project workshop	Ch. 6
11	10/26	Spatial database management systems Spatial querying Lab 08: Attribute join, spatial & attribute querying	Ch. 8, 9
12	11/2	Spatial analysis and modeling Lab 09: Raster analysis / map algebra	Ch. 9, 13
13	11/9	DEM, terrain, and viewshed analysis Lab 10: Spatial analysis and modeling	Ch. 10, 11
14	11/16	Big data & spatial data science Final exam review	Ch. 15
Finals		FINAL EXAM: TBD	

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 honesty

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.

Recording of class-related activity

I invite all of you to join me in actively creating and contributing to a positive, productive, and respectful classroom culture. Each student contributes to an environment that shapes the learning process. Any work and/or communication that you are privy to as a member of this course should be treated as the intellectual property of the speaker/creator, and is not to be shared outside the context of this course.

Students may not make or distribute screen captures, audio/video recordings of, or livestream, any class-related activity, including lectures and presentations, without express prior written consent from me or an approved accommodation from Services for Students with Disabilities. If you have (or think you may have) a disability such that you need to record or tape class-related activities, you should contact Services for Students with Disabilities. If you have an accommodation to record class-related activities, those recordings may not be shared with any other student, whether in this course or not, or with any other person or on any other platform. Failure to follow this policy on recording or distributing class-related activities may subject you to discipline under the Student Code of Conduct.

COVID-19 related policies

Attendance

Students who are sick or who are engaging in self-quarantine in accordance with guidance from the Lincoln-Lancaster County Health Department or their health care professional should not physically attend in-person classes. They must notify the instructor of their absence and must still meet the stated engagement expectations of the course, and they must adhere to the usual codes of conduct and rules of academic integrity that remain in place.

Face coverings

As of July 17, 2020 and until further notice, all University of Nebraska–Lincoln (UNL) faculty, staff, students, and visitors (including contractors, service providers, and others) are required to use a facial covering at all times when indoors except under specific conditions outlined in the COVID 19 face covering policy found at: <https://covid19.unl.edu/face-covering-policy>. This statement is meant to clarify classroom policies for face coverings:

To protect the health and well-being of the University and wider community, UNL has implemented a policy requiring all people, including students, faculty, and staff, to wear a face covering that covers the mouth and nose while on campus. The classroom is a community, and as a community, we seek to maintain the health and safety of all members by wearing face coverings when in the classroom. Failure to comply with this policy is interpreted as a disruption of the classroom and may be a violation of UNL's Student Code of Conduct.

Individuals who have health or medical reasons for not wearing face coverings should work with the Office of Services for Students with Disabilities (for students) or the Office of Faculty/Staff Disability Services (for faculty and staff) to establish accommodations to address the health concern. Students who prefer not to wear a face covering should work with their advisor to arrange a fully online course schedule that does not require their presence on campus.

Students in the classroom:

1. If a student is not properly wearing a face covering, the instructor will remind the student of the policy and ask them to comply with it.
2. If the student will not comply with the face covering policy, the instructor will ask the student to leave the classroom, and the student may only return when they are properly wearing a face covering.
3. If the student refuses to properly wear a face covering or leave the classroom, the instructor will dismiss the class and will report the student to Student Conduct &

Community Standards for misconduct, where the student will be subject to disciplinary action.

Instructors in the classroom:

1. If an instructor is not properly wearing a face covering, students will remind the instructor of the policy and ask them to comply with it.
2. If an instructor will not properly wear a face covering, students may leave the classroom and should report the misconduct to the department chair or via the TIPS system for disciplinary action through faculty governance processes.

*Courses that have been granted an exception to the Face Covering Policy for pedagogical reasons are excluded. Exceptions to the Face Covering Policy are only granted after an approved health safety plan is developed.

Flexibility with instruction methods

This course is designated as an “in person” course for Fall 2020. However, we recognize that the current situation is fluid and we may need to adapt to changing conditions. Therefore, until further notice, all lectures will be posted online via Canvas. You will be able to view these lectures asynchronously on your own time. In-class time will be devoted to *optional* discussion and deeper understanding of lecture and lab materials. **If** conditions stabilize, we will transition back to in-person lectures.

Revisions

2020-08-14: Added policy for recording in-class activity