
PA 541 GEOGRAPHIC INFORMATION SYSTEMS (GIS) FOR PUBLIC ADMINISTRATION

SPRING 2025

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COURSE COMMUNICATION: [Google Chat](#)

CLASS DAYS & TIMES: Wed, 6:10 – 8:30pm
COURSE STRUCTURE: Hybrid
CLASS LOCATION: [113 Tompkins Hall](#)
COURSE WEBSITE: Coming Soon!
OFFICE HOURS: [Schedule an Appointment](#)

COURSE OVERVIEW

COURSE DESCRIPTION

This course introduces the application of Geographic Information Systems (GIS) in public administration and policy. Students learn to manage, analyze, and visualize spatial data relevant to public services. GIS software and programming are used throughout the course.

COURSE CONTENT

Focusing on practical applications and data-driven decision-making, this course explores spatial data in relation to various issues in the public sector, including public safety, urban planning, disaster resilience, social equity, public infrastructure, and social services. Students will use Python programming and ArcGIS Online to aggregate spatial data, perform spatial regression to analyze relationships, and conduct clustering analysis to identify patterns. This course is ideal for students addressing complex social challenges in public and nonprofit sectors, the course requires basic knowledge of statistics and datasets. Prior experience with Python programming is helpful.

LEARNING OBJECTIVES

By the end of this course, students will be able to achieve the following learning objectives (LOs):

- ❑ **Understand Geospatial Data (LO1):** Learn the types, structures, and processing workflows of geospatial datasets commonly used in the public sector.
- ❑ **Design Interactive Visualizations (LO2):** Develop web-based interactive maps using ArcGIS Online and StoryMaps, applying effective visualization and map design principles.
- ❑ **Analyze Spatial Data (LO3):** Manage and analyze spatial datasets using Python to address challenges in public safety, urban planning, and social equity.
- ❑ **Apply GIS Techniques (LO4):** Use spatial regression, clustering analysis, spatial optimization techniques, spatial interpolation, and other modeling methods to analyze relationships, identify trends, and solve complex spatial problems.
- ❑ **Create and Communicate GIS Solutions (LO5):** Develop GIS-based solutions that demonstrate technical proficiency, practical application, and clear communication of insights to stakeholders in public administration and policy.
- ❑ **Evaluate Spatial Data Analytics (LO6):** Assess GIS analysis results to solve real-world problems, support data-driven decision-making, and effectively communicate findings to diverse audiences.

COURSE STRUCTURE

This course is delivered in a hybrid format, meaning it has asynchronous and synchronous components. Asynchronous components are delivered through Moodle and the Course Website. Learning activities in this course include reading assignments, videos, presentations, and individual and group projects. This course consists of four modules. Each module lasts four weeks. Assignment dues will be announced on the Course Website.

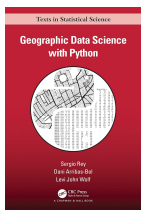
COURSE PREREQUISITES

PA 515 (Research Methods and Analysis), ST 312 (Introduction to Statistics II), PS 571 (Research Methods and Analysis), EC 351 (Econometrics I), or equivalent. Students are expected to have the following foundational knowledge and skills prior to this course:

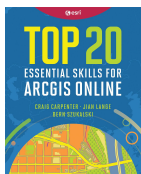
- ▮ Probability, random variables, sampling, and estimation (point and interval)
- ▮ Correlation, simple regression, and multiple regression
- ▮ One-sample t-tests, one-way analysis of variance, and categorical data analysis (e.g., contingency tables)

TEXTBOOKS AND COURSE MATERIALS

REQUIRED TEXT



Title: Geographic Data Science with Python
Author: Sergio Rey, Dani Arribas-Bel, and Levi John Wolf
Publisher: Chapman and Hall
Publication year: 2023
ISBN-13: 978-1032445953
Available at: geographicdata.science/book/intro.html



Title: Top 20 Essential Skills for ArcGIS Online
Author: Craig Carpenter, Jian Lange, Bern Szukalski
Publisher: Esri Press
Publication year: 2024
Available at: catalog.lib.ncsu.edu/catalog/NCSU5957521

OPTIONAL TEXT

- Luc Anselin. [An Introduction to Spatial Data Science with GeoDa](#). CRC Press, 2024.
- Joel Lawhead, [Learning Geospatial Analysis with Python](#). Packt Publishing Ltd, 2019.
- Silas Toms, Paul Crickard and Eric Van Rees. [Mastering Geospatial Analysis with Python](#). Packt Publishing Ltd, 2018.
- Bonnie Shrewsbury and Barry Waite. [Top 20 essential skills for ArcGIS Pro](#). Esri Press. 2023
- Henrikki Tenkanen, Vuokko Vilhelmiina Heikinheimo, and David Whipp. [Introduction to Python for Geographic Data Analysis](#). 2021.

Online Resources

- ArcGIS StoryMaps: doc.arcgis.com/en/arcgis-storymaps/gallery/
- ArcGIS Hub: hub.arcgis.com/search
- PolicyMap: lib.ncsu.edu/databases/policymap
- US Census Mapping Files: [TIGER/Line Shapefiles](#)

SOFTWARE AND TOOLS

We will primarily use [ArcGIS Online](#) and the Python programming environment in [Google Colab](#) for this class. Students may also choose to use [ArcGIS Pro](#) for assignments and exercises if preferred. The instructor may demonstrate certain analyses using ArcGIS Pro. All these software and tools are available to NCSU students at no cost.

DIGITAL COURSE COMPONENTS

The following are the digitally-hosted course components:

- **Course Website:** All course materials, including readings and publicly-available videos, will be uploaded to the course website.
- **Google Chat:** A private chat space designed to facilitate classroom discussions and provide support for course assignments. Use both the instructor and your peers as resources!
- **Moodle:** Platform for grades, announcements, and important updates.
- **Google Forms:** Tool for submitting assignments and completing peer reviews.
- **Panopto:** Access to course recordings. Class meeting recordings are only available to enrolled students.
- **ArcGIS Online:** A platform for students to share maps and geospatial data.
- **Google Sites:** Students will develop their GIS work portfolios on Google Sites, hosting interactive, web-based maps.

COMMUNICATION GUIDELINES

Communication with the Instructor

- **Preferred Mode of Communication:** The preferred mode of communication for course activities is Google Chat. This platform allows us to track questions and discussions effectively over time. Responses can be expected within one business day (i.e., not over the weekend).
- **Email Guidelines:** If you prefer email or need to share documents, you can email the instructor at serena_kim@ncsu.edu. Responses can be expected within two business days (i.e., not over the weekend). If I email you directly, please reply within two business days. It is recommended that you check your NC State email at least once per day to stay up-to-date on course communications. Always include a clear, specific, and concise subject line. Including the course name in your email is highly encouraged, as I teach multiple courses.

Respecting Our Learning Community

The [NC State REG 11.35.05 Code of Student Conduct](#) sets expectations for behavior in both virtual and physical classrooms, as well as consequences for violations. While diverse viewpoints and interpretations of course content are welcome, any behavior that disrupts others' ability to learn and succeed will be addressed.

- Use a respectful tone in all forms of communication, including email, written, oral, and visual formats.
- Maintain professionalism in written communication by avoiding slang, poor grammar, or inappropriate language.
- Respect regional dialects and culturally embedded communication styles.
- Stay home if you have symptoms of a contagious illness (e.g., fever, chills).
- Participate respectfully in our classroom community, whether virtual or physical, by:
 - Avoiding lewd or inappropriate speech or behavior.
 - Maintaining a safe physical environment.
 - Refraining from using your cell phone for calls or texts unless explicitly allowed.
 - Not attending class under the influence of alcohol or drugs.

OTHER STUDENT EXPENSES

None.

GRADING & FEEDBACK

ASSIGNMENTS & EVALUATION PROCEDURE

Component	Weight	Period	Learning Obj.
1. Portfolio	70%		
<i>Part 1. Map Fundamentals: "Building the Basics"</i>	10%	Week 01-04	LO1, LO2, LO5
(a) Process Snapshot (b) Insight Presentation			
<i>Part 2. Spatial Integration: "Connecting the Layers"</i>	15%	Week 05-08	LO2, LO3, LO5
(a) Process Snapshot (b) Insight Presentation			
<i>Part 3. Spatial Analysis: "Mapping Patterns"</i>	20%	Week 09-12	LO3, LO4, LO5
(a) Process Snapshot (b) Insight Presentation			
<i>Part 4. Final Project: "Your Signature Map"</i>	25%	Week 13-16	LO1 – LO5
(a) Process Snapshot (b) Insight Presentation			
2. Participation	30%		
<i>Attendance & Class Discussion</i>	15 %	Week 01-16	LO1 – LO6
<i>Peer Evaluations</i>	10 %	Week 01-16	LO6
<i>In-Class GIS Hackathon</i>	5 %	Week 14-15	LO2 – LO5

1. Portfolio

Students will build a portfolio throughout the course, showcasing their work, including maps, analyses, and presentations. The portfolio will be shared using Google Sites and consist of four key components. For each component, students will submit (a) a Process Snapshot and deliver (b) an Insight Presentation.

(a) Process Snapshot (20%)

- The Process Snapshot helps students stay on track and receive instructor feedback to refine their maps for the Insight Presentation. The Process Snapshot consists 20% of each part of the Portfolio.
- Components of Each Process Snapshot:
 - An interactive map published on the student's Google Site
 - A one-paragraph explanation describing the motivation behind the map and its purpose
 - A one-paragraph description detailing the data source (including units) and the methods used (if applicable)
- Evaluation Criteria:
 - **Interactive Map & Cartographic Principles (50%)**: Adherence to cartographic principles, including appropriate projections, symbology, labeling, color use, and layout, as well as the functionality of the interactive map.
 - **Data & Method Description (30%)**: Clarity and accuracy in describing the data source, units, and methods used.
 - **Timeliness & Effort (20%)**: Submission on time and evidence of thoughtful effort in preparing the map and accompanying explanations.

(b) Insight Presentation (80%)

- The Insight Presentation allows students to refine their maps and narratives to address the needs of a specific audience, such as policymakers, community stakeholders, emergency management teams, or public administrators. Students will prepare a 6-8 minute in-class presentation that tells

a compelling story using the map. Students must identify their target audience and tailor the presentation to meet their priorities.

- Components of Each Insight Presentation (hosted on the Google Site or ArcGIS StoryMaps):
 - A brief description of the hypothetical audience, including their role, priorities, and the relevance of the GIS analysis to their interests
 - An introductory paragraph explaining the motivation behind the project and the key question addressed
 - At least one polished, easy-to-read interactive map embedded in the Google Site or ArcGIS StoryMaps
 - A paragraph detailing the data source, methods, and analysis
 - A paragraph summarizing the key findings and insights from the map and analysis
- Evaluation Criteria:
 - **Audience Identification (15%)**: Clear identification of the hypothetical audience, including their role and an explanation of how the map and analysis address their needs or decision-making processes.
 - **Interactive Map Quality (30%)**: A polished and visually appealing map that adheres to cartographic principles. Interactive elements, such as layers and popups, enhance understanding and usability.
 - **Storytelling & Insights (30%)**: A coherent narrative that highlights key findings and effectively communicates the purpose and value of the analysis. The content is tailored to the audience and is engaging and clear.
 - **Explanation of Data & Methods (15%)**: Clear and concise explanation of the data source, including units, methods, and analysis, avoiding unnecessary jargon.
 - **Delivery & Engagement (10%)**: Confident, professional, and enthusiastic delivery. Engages the audience through clear visuals, thoughtful questions, and effective communication techniques. Poses thoughtful, interesting questions for discussion.

2. Participation

Participation is a key element of this course, as your map visualizations and analyses offer valuable insights for your peers. Participation accounts for 70% of your grade and is assessed based on the following three criteria:

- (a) **Attendance**: Attendance will be recorded during in-person meetings, as outlined in the **Course Schedule** section. To request an excused absence, you must complete the [designated form](#), ensuring your request aligns with the excused absences outlined in [NSCU REG 02.20.03-Attendance Regulations](#). Please note that **absences reported via email will NOT be accepted as excused. Only submissions through the designated form will be considered.** Excused absences will not impact your attendance record, but unexcused absences will result in a prorated reduction of your participation grade based on the number of meetings missed. Note that our class meetings will be recorded and be accessible through Panopto.
- (b) **Peer Evaluation**: You will have four opportunities to provide feedback on your peers' work. While your evaluations will not directly impact their grades, your input will provide valuable insights to your classmates. During each presentation, I will provide a feedback form for you to complete. The feedback will be shared with the presenter, and your evaluation will remain anonymous to them.
- (c) **In-Class GIS Hackathon**: In Week 14, we will conduct a GIS hackathon. I will present a question or challenge, and students will work in groups of three to develop a solution within 1.5 hours. This collaborative activity encourages problem-solving and teamwork.

BASIS FOR FINAL GRADE

A (95-100), A- (90-94.9), B+ (85-89.9), B (80-84.9), B- (80-82), C+ (75-79.9), C (70-74.9), C- (70-72), D+ (68-69), D (63-67), D- (60-62), F (0-59).

GRADE DISSEMINATION

Grades and assignments in this course will be returned on Moodle.

REQUIREMENTS FOR EARNING A GRADE OF “SATISFACTORY”

Requirements for earning a grade of “Satisfactory” If you are taking this course for credit only (S/U), your grade will be reported as S (Satisfactory) when course work is equivalent to C- or better or U (Unsatisfactory) when course work is equivalent to less than a C-. For more information, see the Credit Only Courses regulation.

REQUIREMENTS AND PROCEDURES FOR AUDITING THIS COURSE

Auditing this course is approved on a case-by-case basis. Please contact the course instructor to attain approval. Refer to the Audit regulation for more information and links to required forms.

COURSE SCHEDULE

NOTE: This hybrid course does not meet every week. Below, you will find the schedule indicating when we meet and when we do not. While the meeting dates are fixed, the specific topics covered each week may change. I will do my best to stick with the plan though. Please pay close attention to course announcements on Moodle to stay updated on any adjustments to the schedule. **All materials and assignment instructions and due dates will be posted on the course website.**

Week	Date	Meeting	Topic
Module 1. Map Fundamentals			
01	01/09	Y	Python for GIS & GIS Applications in Public Service
02	01/16	Y	ArcGIS Pro/Online & Types of Spatial Data
03	01/23	N	Design Principles for Cartography
04	01/30	Y	Presentation 1. Map Fundamentals: “Building the Basics”
Module 2. Spatial Data Management			
05	02/06	Y	Visualizing Food and Public Service Accessibility
06	02/13	N	Mapping Crime Data and Traffic Incidents
07	02/20	N	Spatial Regression: Addressing Spatial Dependencies
08	02/27	Y	Presentation 2. Spatial Integration: “Connecting the Layers”
Module 3. Spatial Data Analysis			
09	03/06	Y	Community Resilience, Vulnerabilities, and Spatial Clustering
10	03/13	N	Spring Break
11	03/20	Y	Presentation 3. Spatial Analysis: “Mapping Patterns”
12	03/27	N	Optimizing Community Resources and Evacuation Routes
Module 4. Spatial Data Communications			
13	04/03	N	Creating Interactive Maps with ArcGIS StoryMaps
14	04/10	Y	In-Class GIS Hackathone
15	04/17	Y	Presentation 4. Final Project: “Your Signature Map”
16	04/24	N	Peer Review Report Submission

COURSE POLICIES & PROCEDURES

DIVERSITY AND INCLUSION STATEMENT

It is my intent that students from all diverse backgrounds and perspectives be well-served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: gender identity, sexual orientation, disability, age, socioeconomic status, ethnicity, race, religion, culture, perspective, and other background characteristics. Your suggestions about how to improve the value of diversity in this course are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups. In addition, in scheduling exams, I have attempted to avoid conflicts with major religious holidays. If, however, I have inadvertently scheduled an exam or major deadline that creates a conflict with your religious observances, please let me (serena_kim@ncsu.edu) know as soon as possible so that we can make other arrangements.

STUDENT RULES OF CONDUCT

Students and faculty share responsibility for maintaining an appropriate and respectful learning environment. Students are expected to adhere to the following rules of conduct to maintain a productive and respectful learning environment:

- 🔊 **Respect and Inclusion:** Treat all members of the class—peers, instructors, and guests—with respect. Discrimination, harassment, or inappropriate behavior of any kind is strictly prohibited. This includes professional courtesy and sensitivity toward individuals and topics involving race, color, national origin, gender identity, sexual orientation, disability, age, socioeconomic status, ethnicity, religion, culture, perspective, or other background characteristics.
- 🔊 **Engage Constructively:** Contribute to class discussions and group work in a positive and respectful manner. Allow others the opportunity to share their perspectives without interruption or judgment.
- 🔊 **Maintain Academic Integrity:** Follow NC State's policies on academic integrity. Plagiarism, cheating, or unauthorized collaboration on assignments is not allowed.
- 🔊 **Be Prepared and Focused:** Complete all assigned readings, tasks, and exercises before class. During sessions, silence personal devices, avoid distractions, and stay engaged. Activities such as phone calls, use of headphones, persistent talking, whispering, and web surfing unrelated to the course are prohibited.
- 🔊 **Communicate Professionally:** Use respectful, professional language in all communications, including emails, discussions, and written assignments.
- 🔊 **Respect Class Time and Privacy:** Arrive on time for all meetings and inform the instructor in advance if you need to arrive late or leave early. Do not record or share course content, discussions, or other students' work without explicit permission from the instructor and all involved parties.
- 🔊 **Use Course Tools Appropriately:** Use course-related tools, such as Google Chat, Moodle, and other digital platforms, solely for their intended educational purposes.

Failure to adhere to these behavioral standards may result in disciplinary action. Significant violations may lead to a failing grade for the course and will be reported to the appropriate authorities.

LATE ASSIGNMENTS

Late assignments will be accepted with -50% for every day submitted late. Assignments submitted later than 24 hours past the original due date will NOT be accepted.

INCOMPLETE GRADES, WITHDRAWALS

Information on incomplete grades can be found at REG 02.50.03 – Grades and Grade Point Average. If you encounter a serious disruption to your work not caused by you and you would have otherwise

successfully completed the course, contact your instructor as soon as you can to discuss the possibility of earning an incomplete in the course for the semester, including an agreement on when the remaining work must be done in order to change the grade to the appropriate letter grade. If you student must withdraw from a course or from the University due to hardship beyond their control, see Withdrawal Process and Timeline | Student Services Center for information and instructions.

AI POLICY

The use of Large Language Models (LLMs) such as ChatGPT, Gemini, Perplexity, Phind, Jasper is permitted in this course under the following policies. However, LLMs may produce content that is incorrect, biased, or misleading. Therefore, it is the student's responsibility to verify the accuracy and appropriateness of any content generated by an LLM before including it in their assignments.

Allowed Uses

- ✓ **Code Assistance:** LLMs may be used to generate or debug Python and R code, but students are responsible for ensuring the code is correct.
- ✓ **Brainstorming:** LLMs can be used to brainstorm ideas, such as identifying omitted variables in a model and refine your ideas.
- ✓ **Table Formatting:** LLMs can help combine and format tables. However, please make sure the output from LLM is correct – LLMs make mistakes.
- ✓ **Reference Organizing & Formatting:** LLMs can be used to organize and format references in a coherent style such as APA, Harvard, or Chicago.
- ✓ **Text Editing:** LLMs can be used to correct spelling, typos, and grammar in already written text. Two explicitly allowed prompts in this course are: “Correct grammar, spelling, and punctuation errors” and “Improve clarity and readability without changing the original content.”

Allowed Uses

- ⊘ **Drafting Text:** LLMs should not be used to draft your writing. For example, you cannot provide a single sentence or a short outline and have the LLM generate an entire paragraph or section for your assignment. You cannot have LLM draft the explanation and motivations of your analysis and data visualization. All written content must be your own work.
- ⊘ **Generating Figures:** LLMs cannot be used to create figures for your assignments.
- ⊘ **Data Analysis:** Students are not allowed to upload datasets to LLMs for analysis or to automatically generate results.
- ⊘ **Uploading Our Course Materials to LLM Platforms:** Do not upload any part of this course slides, assignments, or datasets provided by the instructor to LLM platforms. Doing so may violate intellectual property rights.
- ⊘ **Text Editing:** LLMs can be used to correct spelling, typos, and grammar in already written text. Two explicitly allowed prompts in this course are: “Correct grammar, spelling, and punctuation errors” and “Improve clarity and readability without changing the original content.”

Academic Integrity: Students have the responsibility to ensure that their work remains original. The use of LLMs must comply with the university's academic integrity policies. Plagiarism, whether facilitated by an AI tool or any other source, is strictly prohibited. Students must properly cite all sources and ensure their work is the result of their independent effort. For example, originality checking software can be used in this course to detect the originality of the student submission.

❗ **Documentation Requirement:** For every assignment, students must include a section explicitly detailing how LLMs were used, including the specific prompts. If LLMs were not used, students should state, “LLMs were not used in this assignment.”

Failure to adhere to the AI Policy may result in academic penalties, including potential failure of the course, in accordance with the university's policies on academic misconduct. Students are encouraged to ask the instructor for clarification about these policies as needed.

UNIVERSITY POLICIES

ACADEMIC INTEGRITY AND HONESTY

Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct 11.35.01 sections 8 and 9. Therefore, students are required to uphold the Pack Pledge: “I have neither given nor received unauthorized aid on this test or assignment.” Violations of academic integrity will be handled in accordance with the Student Discipline Procedures. Please refer to the Academic Integrity web page for a detailed explanation of the University’s policies on academic integrity and some of the common understandings related to those policies.

STUDENT PRIVACY

Originality Checking Software: Software (e.g., Turnitin) may be used in this course to detect the originality of student submissions.

Class recording statement: In-class sessions are recorded in such a way that might also record students in this course. These recordings will NOT be used beyond the current semester or in any other setting outside of the course.

Class privacy statement: This course requires online exchanges among students and the instructor, but NOT with persons outside the course. Students may be required to disclose personally identifiable information to other students in the course, via electronic tools like email or web-postings, where relevant to the course. Examples include online discussions of class topics and posting of student coursework. All students are expected to respect the privacy of each other by not sharing or using such information outside the course.

OTHER POLICIES

Students are responsible for reviewing the NC State University Policies, Rules, and Regulations (PRRs) which pertain to their course rights and responsibilities:

- Equal Opportunity and Non-Discrimination Policy
- Statement and additional references
- Code of Student Conduct
- Grades and Grade Point Average
- Credit-Only Courses
- Audits

STUDENT RESOURCES

Academic and Student Affairs maintains a website with links for student support on campus, including academic support, community support, health and wellness, financial hardship or insecurity, and more. Find Help on Campus.

DISABILITY RESOURCES

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Resource Office (DRO). For more information on NC State’s policy on working with students with disabilities, please see the Policies, Rules and Regulations page maintained by the DRO and REG 02.20.01 Academic Accommodations for Students with Disabilities.

SAFE AT NC STATE

At NC State, we take the health and safety of students, faculty and staff seriously. The Office for Institutional Equity and Diversity supports the university community by providing services and resources to support and guide individuals in obtaining the help they need. See the Safe at NC State webpage for resources.

SUPPORTING FELLOW STUDENTS IN DISTRESS

As members of the NC State Wolfpack community, we each share a personal responsibility to express concern for one another and to ensure that this classroom and the campus as a whole remains a healthy and safe environment for learning. Occasionally, you may come across a fellow classmate whose personal behavior concerns or worries you, either for the classmate's well-being or yours. If you feel this way, I would encourage you to report this behavior to the NC State CARES website. Although you can report anonymously, it is preferred that you share your contact information so they can follow-up with you personally.

SYLLABUS MODIFICATION STATEMENT

Our syllabus represents a flexible agreement. It outlines the topics we will cover and the order we will cover them in. Dates for assignments represent the earliest possible time they would be due. The pace of the class depends on student mastery and interests. Thus minor changes in the syllabus can occur if we need to slow down or speed up the pace of instruction. To ensure course continuity, changes made to the method of instructional delivery, course structure, course schedule, number of assignments, grading or other aspects of the course after the start of the term will be communicated to all students in written form (e.g., dated syllabus revision or syllabus addendum) when course changes are implemented.