11:573:437 | Spatial Data Visualization and Map Design

Rutgers, the State University of New Jersey
School of Environmental and Biological Sciences
Fall 2025 -- 3 Credits

Meeting Place: **Room 129, Blake Hall**
Meeting Time: **Fridays, 3:50 p.m. – 6:50 p.m.**
Instructor: **Dave Smith**
Office: Room 224, Blake Hall
Email: dave.c.smith@rutgers.edu
Office Hours: See Below
Course Website: CANVAS "MAP DESIGN (FALL 2025)"
Textbook: *Designing Better Maps: A Guide for GIS Users* by Cynthia A. Brewer (ISBN-13: 978-1589484405)
Prerequisites: Fundamentals of Environmental Geomatics Lab (11:573:233) or equivalent. ***Students should have basic knowledge and experience with ArcGIS Pro before taking this course***.

Learning Objectives:

1. Understand and apply the basic principles of the visual representation of spatial data such as symbolization, classification, and generalization.
2. Develop and apply technical skills required for computerized mapmaking using ArcGIS and Adobe Illustrator.
3. Develop and apply skills for clear visual communication of spatial information through mapping, such as appropriate color selection, development of strong visual hierarchy, and designing map products within specified formatting constraints.
4. Develop and apply a strong aesthetic foundation for map design through practice, analysis, and critique.

Course Description:

This course introduces students to the fundamental concepts of cartography: the design and construction of maps. By the end of this course, students should be able to design effective and aesthetically sophisticated maps. They should also have the ability to interpret and critically evaluate the many maps that they encounter as they continue their academic and professional careers.

Course Structure:

Class sessions will consist of a brief peer critique of one student's map from the previous week, followed by a short lecture and a hands-on tutorial introducing relevant techniques. After this, students will be presented with a mapping exercise to work on outside of class. Students will also apply what they have learned throughout the semester to develop a final mapping project.

One-on-One Meetings:

In addition to regular class meetings, each week, students will schedule a 15-minute one-on-one meeting with the course instructor to discuss and receive feedback on their most recent assignment. (Additional office hours will be available by arrangement.)

Projects and Assignments:

Mapping Exercises: each week, students will be presented with an exercise that addresses a different topic in map design or data visualization. These exercises will be completed outside of class time.

Critiques: Each week, one or two students will volunteer to have their most recent map critiqued by the class. All students will be expected to volunteer to have at least one map critiqued during the semester, and all students will be expected to participate in critiques of their classmates' work.

Map Analysis: Every two weeks, each student will be tasked with finding a map that they find to be particularly well designed and to write a short critique analyzing the cartographic decisions that contribute to the map's effectiveness.

Final Project: Each student will design a fully developed large-format map or map series that communicates some phenomenon or phenomena of interest to the student.

Grading:

Composition of Final Grade:	
Mapping Exercises	50%
Map Analyses	15%
Critique Participation	10%
Final Project	25%
Attendance:	See Below

Numerical Ranges for Letter Grades:			
A:	90-100%		
B:	80-86%	B+:	87-89%
C:	70-76%	C+:	77-79%
D:	60-69%		
F:	under 60%		

Late Submission Policy:

Students are responsible for submitting all work on time. The material presented in this course is cumulative, and feedback is essential to improving**. *Any work submitted late will receive a 10% grade deduction***. In addition, ***no specific feedback will be provided for work submitted more than one week late***.

Attendance Policy:

More than two unexcused absences will result in a 10% reduction in your final grade. Each additional unexcused absence will result in a further 10% reduction in your final grade.

Absences may be excused in cases of illness—***if you're sick, stay home***—family emergency, or organized professional development events (*e.g.,* conferences). In such cases, inform your instructor in writing within seven days of returning to campus.

Academic Integrity Policy:

Students will be held to the University's Policy on Academic Integrity, which can be found at: *http://academicintegrity.rutgers.edu/*

Plagiarism in any form is not accepted in this course. Cartography is a field where we often learn best from the work of others. There is a good chance that someone has already found a solution to a problem you are struggling with, or that you will find a map that inspires you think differently about how to approach one that you are designing. While it is acceptable—and even encouraged—to incorporate some of those ideas into your own work, the core of what you present in any map should always be your own work. In order to avoid issues of plagiarism, always consider the following:

- Imitating the overall style or layout of another cartographer's work is not acceptable. While this can be something of a gray area in terms of plagiarism, *it should still be avoided at all costs*.
- Graphical elements (logos, icons, diagrams, *etc.*) that were created by someone else should never be included in your own work—with very few specific exceptions.
- The use of photographs or other imagery that were created by someone else should be avoided in most cases. If used, *full citations* should be provided for those images.

If you have any questions about whether a design decision you've made or an image you've used constitutes plagiarism, feel free to talk to me about your concern.
Here is my policy on the use of generative AI. While it would be naïve to be completely resistant to its use, generative AI is not a replacement for good design or a good design process. AI may help us get a rough sense of what a concept might look like, choose a color palette, or clean up fine details, but ***it should never be how we produce a final product***. The design of a map should be based on an understanding of the underlying data and the phenomenon it represents, a sense of the place, application of good technique, and a creative vision that helps connect the map's contents with its audience. Those are qualities best left to humans. If you find yourself in a situation where you think generative AI would be helpful in any part of your design process, ***please talk to me about it first***.

Use of the Computer Lab:

While working in the lab, standard computer lab rules and common sense apply:

- No food or open drinks are allowed in the lab.
- Do not leave any logged in computers unattended.
- Clean up your desk before leaving.
- Be respectful of others working in the lab.
- Do not attempt to install any software on any computer in the lab.
- Report any malfunctioning computers to your instructor as soon as possible.

Course Schedule:

Week 1 (September 5): Introduction
Assignment: Adobe Illustrator Video Tutorial (Due September 12)

Week 2 (September 12): Graphics Software and Map Layout
Assignments: Preliminary Layout Mock-ups (Due September 19)
Map Analysis 1 (Due September 26)
Readings: Brewer, Chapter 1 *"Planning Maps"*
Brewer, Chapter 3 *"Explaining Maps"*

Week 3 (September 19): Labeling
Assignments: Glen Helen Map Labeling (Due September 26)
Reading: Brewer, Chapter 6 *"Labeling Maps"*

Week 4 (September 26): Typography
Assignment: Glen Helen Map Layout with Descriptive Text (Due October 3)
Map Analysis 2 (Due October 10)
Reading: Brewer, Chapter 5 *"Type Basics"*

Week 5 (October 3): Projections, Coordinates, and Scale
Assignment: Mapping Long-Billed Curlew Migration at Multiple Scales (Due October 10)
Readings: Kimmerling, Chapter 2 *"Map Scale"*
Kimmerling, Chapter 3 *"Map Projections"*

Week 6 (October 10): Map Series (Online Lecture Only)
Assignment: Final Project Preliminary Ideas (Due October 17)
Map Analysis 3 (Due October 24)
Reading: N/A

Week 7 (October 17): Thematic Mapping of Categorical Data
Assignments: Coastal Storm Planning Map (Due October 24)
Reading: Brewer, Chapter 9 *"Customizing Symbols"*
Rost, *"How to pick more beautiful colors for your data visualizations*"
Video: Huffman, *"Mapping in Full Monochrome"*

Week 8 (October 24): Mapping Statistical Data I: The Choropleth Map
Assignment: Mapping Poverty in New Jersey (Due October 31)
Map Analysis 4 (Due November 14)
Readings: Foster *"Statistical Mapping (Enumeration, Normalization, Classification)"*
Brewer, Chapter 8 *"Color on Maps"*
Optional Reading: Brewer and Pickle, *"Evaluation of Methods for Classifying Epidemiological Data on Choropleth Maps in Series"*

Week 9 (October 31): Mapping Statistical Data II: Other Methods
Assignments: Design Iteration (Due November 7)
Reading: TBA
Optional Reading: Quinnan, et al. "*Examining Implicit Discretization in Spectral Schemes*"

Week 10 (November 7): Mapping Terrain Data
--FINAL PROJECT PROPOSAL DUE--
Assignment: Whiskeytown-Shasta-Trinity Recreation Area Terrain Representation (Due November 14)
Reading: Imhoff, Chapter 5 *"The Problem and Its Characteristics"*

Week 11 (November 14): Reference Maps
Assignments: Whiskeytown-Shasta-Trinity Recreation Area Trail Map (Due November 21)
Map Analysis 5 (Due November 28)
Reading: Brewer, Chapter 2 *"Basemap Basics"*

Week 12 (November 21): In-Class Project Work
Optional Reading: Nelson, *"20 Unrequested Map Tips"*

Week 13 (November 28): THANKSGIVING NO CLASS

Week 14 (December 5): Final Project Draft Pin-Up
--FINAL PROJECT DRAFT DUE--
Optional Video: Leroux and Daniel, *"Imprimatur: Printing Maps in Today's Digital World"*

Finals Week (TBD): Final Project Critique

Support for Students with Disabilities

Rutgers University is committed to the creation of an inclusive and safe learning environment for all students, and welcomes students with disabilities into all the University's educational programs. The Office of Disability Services (ODS) is responsible for the determination of appropriate accommodations for students who encounter barriers due to disability. Once a student has completed the ODS process (registration, initial appointment, and submitted documentation) and reasonable accommodations are determined to be necessary and appropriate, a Letter of Accommodation (LOA) can be requested and will be sent to the student and instructor. This should be done as early in the semester as possible as accommodations are not retroactive, and a discussion should occur about how the accommodations will be implemented. More information can be found at www.ods.rutgers.edu. You can contact ODS at (848)445-6800 or via email at dsoffice@echo.rutgers.edu.

Counseling Services

Rutgers provides a variety of mental health support services through the Counseling, Alcohol and Other Drug Assistance Program, and Psychiatric Services (CAPS). They provide crisis intervention, individual and group therapy, alcohol and other drug assistance programs, psychiatric care (medication management), and other services. In addition to general mental health issues, their staff has expertise in issues specifically related to the college environment. More information can be found at https://health.rutgers.edu/medical-and-counseling-services/counseling-services.

DEI Statement

We here at Rutgers are extremely fortunate to have a community of people with diverse backgrounds, life experiences, and perspectives. This diversity of voices enhances the learning experience both inside and outside of the classroom. It can be difficult at times to understand and accept some of these differences, especially when those perspectives may challenge how we perceive ourselves, but learning to acknowledge and to become more comfortable with these differences makes us more well-rounded as people and more competent in our chosen professions. In this class, the expectation is that we will treat each other with respect, empathy, and patience. Disrespectful language or behavior will not be tolerated.

If you feel as though you have been the target of discriminatory behavior, please let your instructor know or report it to the Rutgers Diversity and Inclusion initiative (http://inclusion.rutgers.edu/report-bias-incident/). If you feel as though you have been treated unfairly by your instructor, please speak with them in person or report the incident to the SEBS Office of Academic Programs (https://sebs.rutgers.edu/academics).