

11:573:232 | FUNDAMENTALS OF ENVIRONMENTAL GEOMATICS

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

Meeting Place: Bartlett Hall, Room 123 (BT-123)

Meeting Times: Monday 5:40 p.m. – 7:00 p.m.
Wednesday 5:40 – 7:00 p.m.

Instructor: Dave Smith
Office: Blake Hall, Room 224
Email: dave.c.smith@rutgers.edu

Office Hours: TBA

Course Website: CANVAS "FUND ENV GEOMATICS SPRING 2025"

Prerequisites: There are no prerequisites for this course. However, it is strongly recommended that students take **both** the lecture and the lab course during the same semester.

Textbook: There is no required text for this course. Additional review materials will be provided.

Both this course **and the accompanying lab** are required for the **BSLA** and **Environmental Planning** programs. They are also required for the **Environmental Geomatics Certificate** and **Minor** programs.

Learning Objectives

The purpose of this course is to introduce students to the principles that underlie Geographic Information Systems (GIS) and associated geospatial technologies. By the end of this course, students should be able to do all of the following:

- Explain core concepts underlying the mapping and analysis of geospatial data
- Explain core concepts underlying spatial data structures
- Explain the principles of standard methods for collecting, developing, and managing spatial data
- Critically assess some of the key benefits, shortcomings, and criticisms of GIS

This is a lecture course, and all material will be presented and tested in a lecture course format. It is strongly recommended that students also take the accompanying lab (11:573:233) to gain hands on experience with the tools discussed here.

Course Description

Geomatics is all about understanding what is happening where. With location-based technologies including Geographic Information Systems (GIS), aerial and satellite imagery, and Global Navigation Satellite Systems (*e.g.*, GPS), users of geomatics seek to answer spatial questions ranging from “how do I get to the nearest garden center?” to “how does a novel coronavirus spread across the world to become a global pandemic?”. The reason for the growing popularity and broad appeal of geomatics is simple: if the location of the thing you are asking about is meaningful to the question you are asking, then chances are that geomatics provides the best tools for finding the answer.

This course is designed to give students an introduction to spatial information and technologies for accessing, analyzing, and communicating that information. The purpose of this course is to provide students with an understanding of how these tools and methods work so that students understand **when** and **why** to apply a

given tool or method.

Grading

Composition of Final Grade:

Exam I:	25%
Exam II:	25%
Exam III:	30%
Discussion Paper:	10%
Participation:	10%
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%	

Exams:

The course will have two exams during the semester and a cumulative final. The exams will be administered in-person. They will consist of a combination of multiple choice and short essay questions.

Discussion Paper:

Each student will research an example of a project in which Geomatics plays a major role in the analysis or design process and write a short summary and discussion of how geomatics tools contributed to that project's results.

Participation:

- Students are expected to arrive to class on time and to stay for the duration of the class period. **Regularly arriving late or leaving early will cause a reduction in the student's participation grade.**
- Students are expected to show respect for their classmates and instructor. Deliberately distracting, offensive, or confrontational behavior will not be tolerated. **Disruptive behavior will cause an immediate reduction in the student's participation grade. Repeated acts of disruption will result in further disciplinary action.**
- Students are expected to generally **participate**. Asking questions, answering questions, attending office hours, etc. will all contribute to a higher participation grade.

Attendance:

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

Absences may be excused in cases of illness, family emergency, or organized professional development events (e.g., conferences). For **isolated absences**, students should report their absence using the Rutgers Self-Reporting Absence website (<https://sims.rutgers.edu/ssra/>).

For **extended absences** (two weeks or more) or **repeated absences** (seven or more absences throughout the semester) students must obtain an Absence and Verification Notice (AVN) from the Dean of Students' Office (<https://studentsupport.rutgers.edu/services/absence-and-verification-notices>) to have those absences excused.

Make-up exams will be offered only in cases of documented illness or emergency. In these cases, the student must obtain an Absence and Verification Notice from the Dean of Students' Office (<https://studentsupport.rutgers.edu/services/absence-and-verification-notices>).

Academic Integrity Policy

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

Advice for Success

While this course does not require outside reading and homework, *you should not expect to be successful simply by being present during lectures*. You will need to take on a certain amount of responsibility for engaging with the material and making sure that you understand the more complex concepts.

Here are five strategies that will help you be successful in this class:

1. **Ask questions.** If something isn't clear, ask me to explain. If you're not comfortable asking in front of the whole class, you can ask me afterwards or during office hours.
2. **Take notes.** Don't try to write down every word from the lecture slides (those are already on the slides) focus on things that may require extra explanation, things that I write on the board, things that are unclear or that you have questions about, and things that I say are particularly important.
3. **Review the slides and your notes *the day after lecture*.** The timing is important. If you review the material the same day, it is too fresh in your memory. If you wait too long, you will probably have forgotten ever having seen the material the first time.
4. **Use the review questions.** The review questions are there to help you test your understanding of the material. Try to answer the questions on your own first, then use the keys to check your answers.
5. **Ask questions.** There will probably be things that you thought you understood during the lecture, but after reviewing your notes and going through the review questions, you're not so sure. There is still time to ask questions in office hours, before class, or after class.

Course Schedule

MON	LECTURE	WED	LECTURE
		Jan 22	Introduction/Applications of Geomatics
Jan 27	Spatial Entities and their Relationships	Jan 29	Maps I: Structure and Function
Feb 3	Maps II: Projections and Coordinate Systems	Feb 5	Maps III: Basic Map Design Concepts
Feb 10	GIS	Feb 12	GIS Data
Feb 17	Scale, Detail, and Data Processing	Feb 19	Tables and Attribute Data
Feb 24	EXAM I (Lectures 1-9)	Feb 26	Spatial Analysis
Mar 3	Vector Data Tools I: Queries	Mar 5	Vector Data Tools II: Transforming Geometry
Mar 10	Vector Data Tools III: Overlays	Mar 12	Raster Data Tools I: Map Algebra
Mar 17	SPRING BREAK	Mar 19	SPRING BREAK
Mar 24	Raster Data Tools II: Terrain Operations	Mar 26	Raster Data Tools III: Density and Interpolation
Mar 31	Analyzing Distance and Movement	Apr 2	Data Gathering I: Data Transfer and Secondary Data Capture
Apr 7	EXAM II (Lectures 10-17)	Apr 9	Data Gathering II: Surveying and GNSS
Apr 14	Remote Sensing I: Fundamentals	Apr 16	Remote Sensing II: Examples of Applications
Apr 21	Data Management	Apr 23	Relevance, Uncertainty, and Critical Thinking in Geomatics
Apr 28	How to Approach Geomatics Research	Apr 30	TBA
May 5	Review		
EXAM III – TBA (Cumulative)			

This course fulfills the following program goals for the Bachelor of Science in Landscape Architecture Program.

1. *Explore* the potential of space and spatial relationships to create socially vibrant and culturally inclusive design solutions.
2. *Analyze* and thoughtfully incorporate natural features and systems to create enduring and ecologically sensitive design solutions.

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>).