11:573:232| FUNDAMENTALS OF ENVIRONMENTAL GEOMATICS

Rutgers, the State University of New Jersey
School of Environmental and Biological Sciences
Fall 2022 – 3 Credits

Meeting Place: Blake Hall, Room 128 (BL-128)
Meeting Times: Monday 2:00 p.m. – 3:20 p.m.
Wednesday 2:00 p.m. – 3:20 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 FA22" https://rutgers.instructure.com/courses/193376
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 a rapidly growing field focused on the application of spatial technologies including geographic information systems (GIS), aerial and satellite imagery, and global navigation satellite systems such as GPS. It has applications in a wide array of different disciplines including environmental planning, ecology, and epidemiology to name just a few. 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 the current and emerging 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*** to apply them and ***why***.

COVID-19 Guidelines

Despite the high rate of vaccination among our campus community, and the significant protection that vaccines provide, COVID-19 remains a very real threat. This is particularly true for members of our community who cannot be vaccinated or who have family members at home who cannot be vaccinated.

For that reason, and in keeping with university policy, please be sure to follow these standard guidelines.

1. If you feel unwell, ***DO NOT*** **come to class**. As discussed in the attendance policy below, I will work with you to make up any work that you miss due to excused absence.
2. All students and employees are expected to **wear a mask *that fully covers the mouth and nose*** at all times while inside campus buildings. Please avoid using masks with exhaust valves (these do not prevent disease-causing particles and aerosols from passing out of the mask, increasing the risk of you making others sick). See CDC guidelines for appropriate mask types and care here: https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/about-face-coverings.html
3. **Maintain distance from classmates**. Avoid sitting directly next to other students. Allow other students space while entering and exiting the classroom, etc.
4. **Wash or sanitize hands thoroughly** before and after class.

Again, these guidelines should be followed ***regardless of vaccination status***.

Grading

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 projects results.

Participation Policy:

- 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 adhere to ***all*** of the above COVID-19 guidelines. ***Failure to do so will cause a reduction in the student's participation grade.***

Attendance Policy:

Students are expected to attend all lectures for the full duration of the class period. Attendance will be taken at each class session. You will be expected to sign in with your *full signature*.

Absences may be excused in cases of illness, 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***. Make-up exams will be offered only in the event of documented medical absence.

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 in your final course grade.*

Composition of Final Grade:

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

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%		

Academic Integrity Policy

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

Course Schedule

MON	LECTURE	WED	LECTURE
		Sept. 7	Introduction/Applications of Geomatics
Sept. 12	Spatial Entities and their Relationships	Sept. 14	Maps I: Structure and Function
Sept. 19	Maps II: Projections, Coordinates, and scale	Sept. 21	Maps III: Basic Map Design Concepts
Sept. 26	GIS	Sep. 28	GIS Data and Data Models
Oct. 3	Tables and Attribute Data	Oct. 5	Spatial Analysis
Oct. 10	**EXAM I**	Oct. 12	Vector Data Tools I: Selection, Classification
Oct. 17	Vector Data Tools II: Buffering, Dissolving	Oct. 19	Vector Data Tools III: Overlays
Oct. 24	Raster Data Tools I: Map Algebra	Oct. 26	TBA
Oct. 31	Raster Data Tools II: filtering and Terrain Operations	Nov. 2	Raster Data Tools III: Density and Interpolation
Nov. 7	Analyzing Distance and Movement	Nov. 9	Data Gathering I: Data Transfer and Secondary Data Capture
Nov. 14	**EXAM II**	Nov. 16	Data Gathering II: Surveying and GNSS
Nov. 21	Remote Sensing I: Fundamentals	**Nov. 23**	**Thanksgiving – No Class**
Nov. 28	Remote Sensing II: Examples of Applications	Nov. 30	Data Management
Dec. 5	Relevance, Uncertainty, and Critical Thinking in Geomatics	Dec. 7	How to Approach Geomatics Research
Dec. 12	Important Trends in Geomatics	Dec. 14	Review
EXAM III – TBA			