16:550:545 | INTRODUCTION TO GEOMATICS

Rutgers, the State University of New Jersey
School of Environmental and Biological Sciences
SPRING 2026 – 3 Credits

Meeting Place: Blake Hall, Room 129
Meeting Times: Tuesday, 12:20 – 1:30 p.m.
Additional meeting times by arrangement
Instructor: Dave Smith
Office: Blake Hall, Room 224
Email: dave.c.smith@rutgers.edu
Office Hours: By Arrangement
Course Website: CANVAS – "INTRO TO GEOMATICS SP26"
Prerequisites: There are no formal prerequisites for this course. However, students are expected to have basic computer skills.
Textbook: There is no required text for this course. Required readings will be provided.

This course fulfills the geomatics requirement for the Master of Landscape Architecture program.

Course Learning Objectives:

1. Understand and describe the field of geomatics, its different facets—geographic information systems (GIS), remote sensing, and global navigation satellite systems—and the relevance of these technologies to a variety of other fields.
2. Understand and describe the fundamental concepts, tools, and methods for computer-aided mapping and spatial analysis, and how they are applied.
3. Perform basic functions and apply tools for visualizing, manipulating, analyzing, and generating spatial with ArcGIS Pro.
4. Apply these tools together to perform complex spatial analysis of real-world environmental phenomena.

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.

Through prerecorded lectures, hands-on labs, and an independent project, this course provides hands-on experience with some of the tools and methods commonly used by geomatics professionals as well as the theoretical principles that underlie them.

Access to Computing Resources:

Some work outside of class will generally be necessary. ArcGIS Pro is available for download through the university's software portal (https://software.rutgers.edu/info/login/). However, be aware that ***ArcGIS is available for Windows only***. Mac users will need to use either the physical computer lab or the Rutgers Virtual Computer Lab system (https://it.rutgers.edu/virtual-computer-labs/) for work outside of class.

All necessary data will be available directly through the cloud using Box using the Box Drive app. You should be able to switch seamlessly between computers without needed to upload, download, or sync data. You can download the Box Drive app here: https://www.box.com/resources/downloads

Assignments and Grading:

Composition of Final Grade

Lab Exercises:	60%
Term Project:	30%
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%		

Lab Exercises:

This course will emphasize practical hands-on experience with the tools of GIS through lab exercises. These exercises will consist of two parts. First, students will work though a step-by-step walkthrough of a real-world analysis or application at their own pace. Second, students will apply the tools presented in the walkthrough to a related application with limited instructions.

Term Project:

Students will propose and complete an independent term project. Each student will define a research question to explore using geomatics tools and methods. Students will be expected to acquire the necessary data, apply appropriate analytical methods, and interpret and present the results of their analysis. The deliverable for this project will be a formal written report.

Late Submission Policy:

- ***Any work submitted less than one week late will be docked 10 points.***
- ***Any work submitted more than one week late will NOT be accepted.***

Ownership of Student Work:

The Rutgers Department of Landscape Architecture maintains a permanent archive of student work. While you will retain authorship and intellectual property rights, all completed and submitted assignments belong to the department with full permission for the department to publish and publicize the work.

Academic Integrity Policy:

While students are encouraged to discuss and collaborate on exercises and assignments within reasonable limits, ***all submitted work must be the individual work of the student submitting it***. If any student is caught submitting work completed by another student, both will receive a grade of 0 for that assignment. For a second infraction of this rule, the offending student will be reported to the administration for further discipline.

In addition, ***any written or graphical material submitted as a part of any assignment must be the original work of the student***. Exceptions will be made for authoritative works, when specifically referencing the authority of that work (*e.g.,* a diagram of the process of applying for buyouts under the Green Acres program produced by the NJDEP is acceptable because that organization is responsible for that process). ***Any work not produced by the student must be properly cited***.

The University's Academic Integrity Policy can be found at:
http://academicintegrity.rutgers.edu/academic-integrity-policy/

Course Schedule:

Week 1: Introduction to Geomatics and GIS

January 18 – January 24

- **Lecture**
  - Geomatics?
- **Readings**
  - GIS Commons, Chapter 1
  - GIS&T Body of Knowledge Summary of Topics
- **Lab**
  - Lab1: Introduction to ArcGIS Pro

Week 2: Map Basics

January 25 – January 31

- **Lectures**
  - Structure and Function
  - Types of Maps
- **Readings**
  - Thematic Cartography and Geovisualization, Chapter 5
- **Lab**
  - Lab2: Mapping Categorical Data and the Map Layout

Week 3: Relating Maps to the Earth

February 1 – February 7

- **Lectures**
  - Coordinate Systems
  - Map Projections
  - Map Scale
- **Readings**
  - Map Use, Chapter 3
  - The Impossible Map (video)
- **Lab**
  - Lab 3: Mapping Statistical Data

Week 4: Map Design

January 8 – February 14

- **Lecture**
  - Basic Map Design Concepts
- **Reading**
  - TBA
- **Lab**
  - Lab 4: Basic Map Design Concepts

Week 5: GIS Data

February 15 - February 21

- **Lectures**
  - Basic Data Structures
  - Data Detail and Complexity
  - File Formats and Data Handling
- **Readings**
  - TBA
- **Lab**
  - Lab 5: Understanding GIS Data

Week 6: Spatial Analysis Concepts

February 22 – February 28

- **Lectures:**
  - Spatial Entities and their Relationships
  - Spatial Analysis
- **Readings**
  - TBA
- **Lab**
  - Lab 6: Spatial Analysis Concepts

Week 7: Tables and Attribute Data

March 1 – March 7

- **Lectures**
  - Database Table Structure and Queries
  - Simple Analytical Functions
  - Working with Multiple Tables
- **Readings**
  - TBA
- **Lab**
  - Lab 7: Working with Tables and Attribute Data

Week 8: Analyzing Vector Data

March 8 – March 14

- **Lectures**
  - Location Queries
  - Transforming Geometry
  - Vector Overlays
- **Readings**
  - TBA
- **Lab**
  - Lab 8: Analysis of Vector Data

Week 9: SPRING BREAK

March 15 – March 21

Week 10: Analyzing Raster Data

March 22 – March 28

- **Lectures**
  - Map Algebra
  - Terrain Analysis
- **Readings**
  - TBA
- **Lab**
  - Lab 9: Analysis of Raster Data

Week 11: Data Gathering and Management

March 29 – April 4

- **Lecture**
  - Data Management
- **Readings**
  - TBA
- **Labs**
  - Lab 10: Secondary Data Sources
  - Lab 11: Geocoding and Heads-Up Digitizing

Week 12: Field Data Collection

April 5 – April 11

- **Lecture**
  - GNSS
- **Readings:**
  - TBA
- **Lab**
  - Lab 12: Esri Field Maps

Week 13: PROJECT WORK

April 12 – April 18

Week 14: PROJECT WORK

April 19 – April 25

Week 15: PROJECT WORK

April 26 – May 2

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).