11:573:232| FUNDAMENTALS OF ENVIRONMENTAL GEOMATICS

Rutgers, the State University of New Jersey
School of Environmental and Biological Sciences
Spring 2020

Meeting Place: Cook/Douglass Lecture Hall (CDL) 110
Meeting Times: Monday 5:35 p.m. – 6:55 p.m.
Wednesday 5:35 p.m. – 6:55 p.m.

Credits: 3

Instructor: Dave Smith
Office: Blake Hall, Room 224
Email: dave.c.smith@rutgers.edu
Office Hours: Tuesday 2:30 p.m. – 4:00 p.m.

Course Website: *https://canvas.rutgers.edu/* -- course site is listed as "FUND ENV GEOMATICS EP20"

This course is REQUIRED for the ***BSLA*** and ***Environmental Planning*** programs. It is 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
- Describe how to query spatial databases
- Describe how common spatial analysis software tools function
- Explain the principles of standard methods for collecting, developing, and managing spatial data
- Critically assess some of the key benefits, shortcomings, and criticisms of geographic information systems

This is a lecture course, and all material will be presented and tested in a lecture course format. Those students looking for hands on experience with these tools should also register for the lab (11:573:233).

Prerequisites:

There is no prerequisite for this course. However, students are strongly encouraged to take both the lecture and lab courses. **Both** the lecture and the lab courses are required the *BSLA* and *Environmental Planning* programs, as well as for the *Environmental Geomatics Certificate* and *Minor* programs.

Course Description:

Geomatics is a rapidly growing field that has applications in a wide array of different disciplines including urban and environmental planning, ecological analysis and modeling, epidemiology, and emergency response and management to name just a few. It incorporates Geographic Information Systems (GIS), Remote Sensing, and Global Navigation Satellite Systems like GPS, along with other spatial sciences. 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***.

Textbook:

Required Text: There is no required text for this course.
Recommended text: *GIS Fundamentals, 4th Edition* by Paul Bolstad (ISBN 978-0-9717647-3-6)

Additional Study Materials:

Additional review materials will be provided.

Grading:

Exams:

The course will have three hourly in-class exams. These will consist of a combination of true/false, multiple choice, and short answer 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.

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.

Participation Policy:

- Students are expected to arrive to class on time and to stay for the duration of the class period
- Students are expected to show respect for their classmates and instructor. Deliberately distracting, offensive, or confrontational behavior will not be tolerated.

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/academic-integrity-policy/.

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, Coordinates, and scale	Feb. 5	GIS
Feb. 10	GIS Data and Data Models	Feb. 12	Tables and Attribute Data
Feb. 17	Spatial Analysis	Feb. 19	Vector Data Tools I: Selection, Classification
Feb. 24	**EXAM I**	Feb. 26	Vector Data Tools II: Buffering, Dissolving
Mar. 2	Vector Data Tools III: Overlays	Mar. 4	TBA
Mar. 9	Raster Data Tools I: Map Algebra	Mar. 11	Raster Data Tools II: Statistical, filtering, and Terrain Operations
Mar. 16	**Spring Break**	**Mar. 18**	**Spring Break**
Mar. 23	Raster Data Tools III: Density and Interpolation	Mar. 25	Analyzing Distance and Movement
Mar. 30	**EXAM II**	Apr. 1	Data Gathering I: Data Transfer and Secondary Data Capture
Apr. 6	Data Gathering II: Surveying and GNSS	Apr. 8	Remote Sensing I: Fundamentals
Apr. 13	Remote Sensing II: Examples of Applications	Apr. 15	Data Management
Apr. 20	Online GIS	Apr. 22	Relevance, Uncertainty, and Critical Thinking in Geomatics
Apr. 27	How to Approach Geomatics Research	April 29	Important Trends in Geomatics
May 4	Review		
EXAM III - TBA*			

* The university's policy on exam scheduling and conflicts can be found at: *http://nbregistrar.rutgers.edu/facstaff/examrules.htm*. If you have a conflict that is consistent with this policy, be sure to let your instructor know well in advance of the exam date, so that we can work out an alternative.