20Jan13/sdd

CSS 4200 Geographic Information Systems
Spring 2013

Course Syllabus

This course focuses on the principles and applications of geographic information systems for characterizing and assessing agronomic and environmental systems. Accessing, updating, analyzing, and mapping geo-spatial data are emphasized. Needs assessment; spatial data accession; coordinate systems; spatial database design, construction, and maintenance; modeling and analysis; map accuracy assessment; and digital cartography are considered. The course is intended for undergraduate and graduate students who have the desire to understand the basic concepts underlying geographic information science and technology. Issues related to needs assessment, collaborative spatial decision making, and implementation of GIS within organizations are discussed.

Course Goals

- Increase student awareness of geographic information science and technology.
- Provide opportunities to process, analyze, and visualize geospatial data and information using commercially-available Geographic Information Systems (GIS) software.
- Generate enthusiasm and interest in using GIS for meeting environmental assessment needs.
- Gain an appreciation for the complexities of data manipulation, analysis, and mapping at different scales of space, time, and complexity.

Course Learning Objectives:

- Understand the structure and function of geographic information systems
- Develop proficiency in coordinate systems, projections, and datums
- Understand the types of spatial data models and appropriate application environment
- Develop proficiency for developing a geospatial database
- Practice elementary and intermediate-level geospatial data processing methods
- Practice elementary and intermediate-level geospatial data analysis methods
- Increase awareness of geospatial data assessment and visualization methods
- Conduct an independent applications-based project
- Develop and present an oral, collaborative group project report

Important Skill Development Expectations:

- Creating geodatabases
- Preparing data for ArcGIS
- Projecting spatial data
- Georeferencing and digitizing scanned paper maps
- Joining data to maps
- Editing boundaries
- Working with attribute tables
- Querying/selecting attributes

- Querying/selecting attributes by location
- Joining attributes
- Creating buffers
- Analyzing spatial data
- Creating well-designed layouts
- Creating continuous and categorical variable maps
- Creating reports and associated graphics and illustrations

Instructors

Dr. Stephen D. DeGloria
Professor
Department of Crop and Soil Sciences
1014 Bradfield Hall
sdd4@cornell.edu
Office Hours: TBA; available during laboratory sections

Dorisel Torres
Graduate Teaching Assistant
Graduate Field of Soil and Crop Sciences
908 Bradfield
dt273@cornell.edu
Office Hours: TBA; available during laboratory sections

Course Materials

Lectures, readings, problem sets, and laboratory exercises are posted to the course site at http://blackboard.cornell.edu
Self-enrollment: Access Code = ***GISs13***

Expectations and Responsibilities

Students are expected to have a basic knowledge of computer systems and data processing methods using both Windows or similar windows-based systems and command line operations similar to that found in older DOS-based programs. Students should be able to communicate to instructors using electronic mail, and to access and search the Internet for data and information relevant to the course. A working knowledge of Word, Excel, Access, and Powerpoint is helpful.

A major responsibility of the instructors is to promote an active learning environment in the course which requires instructors and students to be motivated, participatory, and communicative. Lecture assignments, laboratory quizzes, and exams are designed to be conducted independently. Course project reports will be developed and delivered by self-defined groups of 2-3 students each and may include students from disparate lab sections.

Instructors and students are expected to adhere to Cornell University's Code of Academic Integrity <http://cuinfo.cornell.edu/Academic/AIC.html>. This code includes the following statements: "A Cornell student's submission of work for academic credit indicates that the work is the student's own. All outside assistance should be acknowledged, and the student's academic

position truthfully reported at all times…" A practical guide to the code is available <http://www.theuniversityfaculty.cornell.edu/AcadInteg/>.

Course Textbook
Bolstad, P. 2012. GIS Fundamentals, 4th Ed. Eider Press. White Bear, Lake Minnesota.

There are two copies of this textbook on 2-hour reserve at Mann Library. The course textbook is available through the Cornell Campus Bookstore. You may also purchase the book on-line: http://www.bookmasters.com/marktplc/00729.htm, or elsewhere.

You may visit Dr. Bolstad's website to get .pdf versions of Chapter 3 and all chapter graphics <http://www.paulbolstad.net/gisbook.html>.

Assignments and Grading

Lab Exercises (9@25pts)	225 (45%)
Lab Quizzes (2@25pts)	50 (10%)
Prelim Exams* (2@100pts)	200 (40%)
Class Participation	25 (5%)

* There will be two prelim exams. There is not a final examination in the course. Laboratory ***group*** project presentations will be scheduled during your regularly scheduled lab section, or **Monday afternoon, 29 April** or **Thursday, 02 May**, or by special arrangement.

Students with Disabilities
Students with disabilities are encouraged to meet with the instructors in order that course materials can be updated and adapted appropriately to better foster a positive teaching and learning experience.

Lecture Schedule:
MW 9:05 - 9:55a, 101 Bradfield Hall

Powerpoint lectures will be provided on the Blackboard site shortly after each lecture. Note that the content of these slides is only a portion of what is discussed in class or available through reading assignments, and should not take the place of class attendance and participation.

Week	Day	Date	Topic	Readings / Assignments
1	M	21Jan	Course Objectives and Overview; Lab01 overview	Bolstad: Ch. 1
	W	23Jan	Coordinate Systems, Projections, and Datums	Bolstad: Ch. 3
2	M	28Jan	Coordinate Systems, Projections, and Datums Geospatial Data Types and Models; Lab02 overview	Bolstad: Ch. 2
	W	30Jan	GIS Structure and Function	Bolstad: Ch. 4
3	M	04Feb	Spatial Database Design and Development; Lab03 overview	Bolstad: Ch. 4, 8
	W	06Feb	Spatial Data Pre-processing	Bolstad: Ch. 8
4	M	11Feb	Attributes Data and Tables	

	W	13Feb	Data Sources and Accession	Bolstad: Ch. 7
5	M	18Feb	Data Types and Classification; Lab04 overview	
	W	20Feb	Spatial Analysis: Vector GIS Operations	Bolstad: Ch. 9,10
6	M	25Feb	Spatial Analysis: Raster GIS Operations; Lab05 overview	
	W	27Feb	Surfaces and Terrain Analysis	Bolstad: Ch. 11
7	M	04Mar	Surfaces (con't); Spatial Interpolation; Lab06 overview	Bolstad: Ch. 12
	W	06Mar	***Prelim Review***	
8	M	11Mar	Spatial Interpolation (continued)	
	W	13Mar	***Prelim #1***	
9	*M*	*18Mar*	***Spring Break***	
	W	*20Mar*	***Spring Break***	
10	M	25Mar	Spatial Modeling and Applications; Lab07 preview	Bolstad: Ch. 13
	W	27Mar	Case Study: Arsenic Risk Assessment in Bangladesh	
11	M	01Apr	Case Study: Export Coefficient CADA Modeling	
	W	03Apr	Assessing and Managing Error in Spatial Data	Bolstad: Ch. 14
12	M	08Apr	Visualizing Spatial Data – Digital Cartographic Techniques; Lab08 overview	
	W	10Apr	Distance Spatial Modeling	
13	M	15Apr	Global Navigation Satellite Systems; Lab09 overview	Bolstad: Ch. 5
	W	17Apr	***Prelim Review***	
14	M	22Apr	Spatial Networks	
	W	24Apr	***Prelim #2***	
15	M	29Apr	Model Builder in ArcMap	
	W	01May	Course Summary/Discussion (Course Evaluations on-line)	

Laboratory Schedule:
M, 2:30p – 4:25p, or R, 2:00p – 4:25p
B30B Mann Library Computer Classroom

Week	Date	Topic
1	21Jan	Lab and Project Resources, GIS Software Familiarization (**Lab #1**)
2	28Jan	Project Design, Coordinate Systems, and Database Preparation (**Lab #2**)
3	04Feb	Map Digitizing and Editing (**Lab #3.1**)
4	11Feb	Map Digitizing and Editing (**Lab #3.2**)
5	18Feb	Practice with Polygon and Raster Features in Geodatabases (**Lab #4**)
6	25Feb	Accessing and Processing Soil Geographic Databases (**Lab #5**)
7	04Mar	Spatial Interpolation Using Geostatistics and Spatial Analysis (**Lab #6**); **Lab Quiz #1**
8	11Mar	Spatial Interpolation Using Geostatistics and Spatial Analysis (**Lab #6**)
9	18Mar	***Spring Break***
10	25Mar	Spatial Analysis of Agroecological Zones (**Lab #7.1**)
11	01Apr	Spatial Analysis of Land Suitability Constraints and AEZ Assessment (**Lab #7.2**)

12 08Apr Map Layout and Production (**Lab #8**); **Lab Quiz #2**

13 15Apr Map Layout and Production (**Lab #8**)

14 22Apr Google Earth exports; Metadata; and Project Report Preparation and Presentation **(#9**)

15 29Apr Group Project Presentations (**Lab #9**)*

*06May, 07May Project Presentations (Alternate)

For those who would like additional practice with the GIS software we are using in lab sections, Professor Bolstad has made available ArcGIS Lessons (with exercises/data/videos) on his web site. Please avail yourself to these resources as warranted: <http://www.paulbolstad.net/gisbook.html>.

Resources

All laboratory sections will be held in B30B Mann Library. Lab assignments are designed to be completed during the normal laboratory period and during open lab periods as posted in the course schedule.

Data Storage/Back-up

Students are required to provide media to back-up lab data on a weekly basis. An external drive, Google cloud, or folder on a local server drive are options. To be discussed during lab sections.

Useful Web Sites:

Cornell University Geospatial Information Repository (CUGIR):
http://cugir.mannlib.cornell.edu/

New York State GIS Clearinghouse:
http://gis.ny.gov

Earth Explorer
http://earthexplorer.usgs.gov

Geospatial Data Gateway:
http://datagateway.nrcs.usda.gov/

The National Map Seamless Server:
http://nationalmap.gov/viewer.html

National Spatial Data Clearinghouse:
http://www.fgdc.gov/dataandservices

Geospatial One-Stop:
https://explore.data.gov/Geography-and-Environment/Geospatial-One-Stop/a37f-apnw