

# Geography 5220: Fundamentals of GIS

The Ohio State University

Autumn 2014

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Lecture: Smith Lab 1009, Mo We 12:40 - 1:35 PM  
Lab: Derby Hall 0140, Mo 1:50 - 2:45 PM or We 3:00 - 3:55 PM  
Course URL: <http://carmen.osu.edu>

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This course introduces principles of geographic information systems and their applications in spatial analysis and information management. The course is designed to give students an understanding of cutting-edge geospatial technologies, their capabilities, uses, and limitations. Representative applications for each discipline area are demonstrated in the computer laboratory portion.

## Textbook

We use the book *GIS Fundamentals: A First Text on Geographic Information Systems* (4th Ed, Bolstad, P. Eider Press, 2012) as the required text. If ordering the textbook takes too long, you can download the first three chapters from the web site at <http://www.paulbolstad.net/gisbook.html>, which also includes information about how to order a digital copy of the book. During the semester, various handouts will be made available either on the course website or during class. These handouts will be mainly used for in-class exercises and discussions.

## Evaluation

Standard OSU grading scale will be used for evaluation. Grading will be based on four elements:

- Lab exercises (40%).
- Midterm exams (20%). There will be three midterm exams. The first two midterms are closed book exams and only the materials covered in the time before each of the midterms will be used in the exam. The third one is a take-home exam where students must finish some GIS applications by their own.
- Final exam (20%). This will be a comprehensive exam with an emphasis on materials after the second midterm exam.
- Participation, exercises, and quizzes (20%). There will be plenty of in-class and/or take-home quizzes/exercises/readings during the semester. Your participation in these activities will also be used to count your attendance.

## Course Schedule

A tentative course schedule is available at [here](#). Please check the web site frequently because materials listed in the schedule will be updated each week.

## Computer Laboratories

We will use the geography computer lab in Derby 0140 to complete the labs. Lab reports are generally due in one or two weeks, as indicated in each lab assignment. There are five lab assignments. We will use the geography computer lab in Derby 0140 to complete these assignments. Lab assignments will include the following:

**Lab 1.** Introduction to ArcGIS, Geodata, and Map Projections. Using ArcGIS, students will become familiar with the ESRI ArcGIS software, explore different types of geodata available, learn basic database operations, and learn about the different types of map projections. Specific objectives include learning how to use ArcGIS; the types of geodata in a GIS environment – vector, raster and images; how to display data in ArcGIS; types of map projections; and how to generate a meaningful map.

**Lab 2.** Vector Data Operations. Using ArcGIS, students will become familiar with vector data operations. Specific objectives are to perform visual interpretations of vector data, learn vector buffer operations, and learn basic vector operations using the ArcGIS GeoProcessing wizard.

**Lab 3.** Raster Data Operations. Using ArcGIS, students will become familiar with raster data and learn simple data manipulations in a raster system. Specific objectives are to understand and learn general aspects and display of raster data (grid dataset), map algebra/data reclassification, and raster buffer operations.

**Lab 4.** Data Relations. The purpose of this lab is to become familiar with data relationships in a GIS. Specific objectives are to understand the relationships in datasets and attribute/spatial relations, and to learn the difference between a join and relate operation.

**Lab 5.** Geodatabases. The purpose of this lab is to learn the fundamentals of the geodatabase as a form of spatial data organization while exploring some of the format's built-in functionality including relationship specifications and connectivity and topology rules.

**QGIS.** This is a lab design the help students understand the advances in open-source GIS software packages. We pick a highly popular package and tour the many of the GIS tasks that we have introduced using the commercial package. We encourage students to take a closer look at the open-source movement in geospatial technology and possibly beyond and compare and contrast them with the commercial ones.

**Lab 6.** Applications of GIS. Final Project. Students will perform a spatial analysis exercise, given only the criteria to use for reaching a conclusion. Objectives are to explore a data set and the geographic distribution of the variables and to arrive at several conclusions. Other objectives include learning to design and perform the necessary data analysis in a vector-based or raster-based GIS. Data export utilities to other applications, such as Microsoft Access or Excel, will be learned for developing a more complete statistical analysis of spatial data.

## Important Issues

**Late papers.** I will not accept any make-ups for in-class exams and exercises or quizzes.

**Exceptions may be granted in cases such as serious illness, family emergency, or career opportunities, if requests were made before class starts. GTA's will have their policies regarding late submissions of lab reports.**

**Academic Misconduct:** It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. **Plagiarism is wrong and should be prohibited.** Instructors shall report all instances of alleged academic misconduct to the Committee (Faculty Rule 3335-5-847). For additional information, see the Code of Student Conduct (<http://studentaffairs.osu.edu/csc/>).

**Disability Services:** Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated, and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD292-0901; <http://www.ods.ohio-state.edu/>.

# Geography 5220: Course Schedule

The links in this schedule will be made available before class.

Week	Date	Topics	Readings	Labs & More
1	8/27	<a href="#">Introduction</a>	1	
2	9/1	No class (Labor Day)		
	9/3	<a href="#">Representations</a>	2	
3	9/8	<a href="#">Vector data</a>	2	<a href="#">Introduction to GIS</a>
	9/10	<a href="#">Vector operations</a>	9	
4	9/15	<a href="#">Vector overlay</a>	9	<a href="#">Vector data operations</a>
	9/17	<a href="#">Raster data</a>	2	
5	9/22	<a href="#">Remote sensing</a>	6	
	9/24	<a href="#">Raster operations</a>	10	
6	9/29	<a href="#">Other data models</a>	2,+	<a href="#">Raster data operations</a>
	10/1	<b>Midterm 1</b>		
7	10/6	<a href="#">Georeferencing</a>	3,4+	
	10/8	<a href="#">Digital data sets</a>	7,+	
8	10/13	<a href="#">Datums</a>	3	<a href="#">Data relations</a>
	10/15	<a href="#">Projections</a>	3	
9	10/20	<a href="#">Databases</a>	8	
	10/22	<a href="#">Databases</a>	8	
10	10/27	<a href="#">Mapping</a>	4,+	<a href="#">Geodatabases</a>
	10/29	<a href="#">Mapping</a>	4,+	
11	11/3	<a href="#">Mapping examples</a>		
	11/5	<b>Midterm 2</b>		
12	11/10	<a href="#">GNSS</a>	5	
	11/12	<a href="#">Storage</a>	8,+	
13	11/17	<a href="#">Spatial analysis: Moran's I</a>	13,+	<a href="#">QGIS</a>
	11/19	<a href="#">Spatial analysis: k-function</a>	12	
14	11/24	<a href="#">Terrain analysis</a>	11	<a href="#">Final projects</a>
	11/26	No class (Thanksgiving)		
15	12/1	<a href="#">Multicriteria spatial decision</a>	13	
	12/3	<a href="#">Systems</a>	+	
16	12/8	<a href="#">GIS ethics</a>	15,+	<b>Midterm 3 Due</b>
17	12/17	<b>Final (12:00-1:45 PM)</b>		

[Go to course syllabus](#)

Last update: 08/28/2014 13:02:10