

## GIS and Spatial Analysis

**Lecture:** Wednesday 11-12:50pm, 1124 LeFrak Hall

**Lab:** Th 9–10:50am (0101, 1136 LeFrak), Friday 11am–12:50pm (0102, LeFrak 1138)

**Instructor:** Naijun Zhou, Ph.D., 1125 LeFrak, 301-405-4063, e-mail: njzhou@umd.edu  
Office hours: Wednesday 1:20-3:00pm, or by appointment

**Teaching Assistant:** Rachel Marks, Ph.D. student, e-mail: rmoore.geog@gmail.com  
Office hours: TBA

**Course Website:** ELMS (<http://elms.umd.edu>)

### Course Objectives

This advanced GIS course introduces the analytical use of geospatial information. Students will develop an understanding of spatial analysis methods, and learn practical skills of using GIS and spatial analysis to discover features of spatial distribution. The class covers the methods of spatial analysis including

- 1) creating and querying geospatial databases by attribute and by location,
- 2) measuring geometric features and identifying the spatial patterns of geospatial objects that are represented as point, line, network and polygon data, and
- 3) generating and analyzing 3-D surfaces.

As an important component of this class, labs are designed closely related to lectures and provide hands-on experiences of spatial analysis using GIS software ArcGIS 10.

### Prerequisites

GEOG373 (Introduction to GIS) or equivalent, which covers GIS data models, map projections, coordinate systems, computer cartography, basic geodatabases, data collection, data standard and quality, and basic spatial analysis (buffering, geocoding, overlay, classification and dissolve).

### Textbooks

There are no required textbooks. The following books are used for some lectures and can be checked out at library:  
Andy Mitchell, 2005. *The ESRI Guide to GIS Analysis Volume 2: Spatial Measurements & Statistics*. ESRI Press. ISBN: 158948116X. Call number: G70.212 .M58 1999.

Paul Bolstad, 2005. *GIS Fundamentals: A First Text on Geographic Information Systems*, 2nd Edition. Eider Press, White Bear Lake, Minnesota, 2005. ISBN: 0971764719. Call number: G70.212 .B64 2008.

David O'Sullivan, David Unwin, 2003. *Geographic Information Analysis*, John Wiley & Sons. ISBN: 0471211761. G70.212.085 2003.

Andy Mitchell, 1999. *The ESRI Guide to GIS Analysis Volume 1: Geographic Patterns & Relationships*. ESRI Press. ISBN: 1879102064. Call number: G70.212. M58 1999.

### Course Requirements and Important Information

- **FIVE** topics are covered: geospatial databases, point data analysis, line and network data analysis, area data analysis, and surface analysis.
- **ELEVEN** labs that are grouped into the above **five** topics.
- **FIVE** homework assignments, each for one topic. Each includes findings from lecture materials and lab exercises. A hardcopy of completed homework must be turned in at the beginning of the lab at which they are due. Each homework assignment will be distributed during labs, will include lab exercise result and/or discussion questions. **You are expected to start the work early. Never underestimate the time you will spend on the assignments.**
- **TWO** in-class, non accumulative, close-book, close-note exams. The exams include the materials covered in **lectures**. The exam format is a combination of short answers, essay, and multiple choice.

- Attendance at all lectures and labs is required because no texts perfectly cover the lecture materials and the lab exercises are essential to learning practical skills. Lab and lecture absences, late work and make-up exams are given for University approved excused absences, and students must notify the TA and/or the Instructor and make arrangement at least 24 hours **BEFORE** the due date. Students also need to provide valid documents for absence, late work and make-ups. Otherwise, **no late work and make-up requests will be accepted.**
- Materials including lecture slides, announcements and others will be posted on Canvas. Check Canvas frequently. Lab instructions and homework questions are stored in Geography Lab computers.
- The instructor will make every effort to accommodate students who are registered with the Disability Support Services (DSS) Office and who provide the instructor with a University of Maryland DSS Accommodation form. This form must be presented to the instructor as soon as possible.
- **E-mail:** for efficient communication, please put "GEOG473" in email subject and your full name in email body.
- **COMMUNICATE!** Feel free and do not hesitate to contact the instructor and the TA if you have any concerns, critiques and suggestions. They are ALWAYS welcome, and the earlier the better.
- **Bring a CALCULATOR to each lecture.**

### Course Schedule

Week	Date	Lecture	Optional Readings	Lab and Due date
1	1/28	Introduction		
	1/29,30			No LAB
2	2/4	Query I: Database & DBMS	Bolstad, Ch.8	
	2/5,6			Lab 1.1 Geodatabases I
3	2/11	Query II: SQL, selection	Bolstad, Ch.8	
	2/12,13			Lab 1.2 Geodatabases II
4	2/18	Point data analysis I: Geometric measurements	Mitchell (2005), Page 21-50	
	2/19,20			<b>Homework 1 due 2/19,20;</b> Lab 2.1 Point data analysis I
5	2/25	Point data analysis II: Density & cluster	Mitchell (2005), Page 80-103, 147-162	
	2/26,27			Lab 2.2 Point data analysis II
6	3/4	Point data analysis III: Autocorrelation	Mitchell (2005), Page 135-145	
	3/5,6			Lab 2.3 Point data analysis III
7	3/11	<b>Exam I: 11-12:50pm, 1124 LeFrak</b>		
	3/12,13			No LAB
8	3/18	<i>Spring Break</i>		
	3/19,20			No LAB
9	3/25	Line data analysis	Mitchell (2005), Page 51-60	
	3/26,27			<b>Homework 2 due 3/26, 27;</b> Lab 3.1 Line data analysis
10	4/1	Network analysis		
	4/2,3			Lab 3.2 Network analysis
11	4/8	Area data analysis I: Geometric measurements		
	4/9,10			<b>Homework 3 due 4/9, 10;</b> Lab 4.1 Area data analysis I
12	4/15	Area data analysis II: Autocorrelation	Mitchell (2005), Page 104-132, 163-180	
	4/16,17			Lab 4.2 Area data analysis II
13	4/22	Surface analysis I: Interpolation	Bolstad, Ch. 12	
	4/23,24			<b>Homework 4 due 4/23, 24;</b> Lab 5.1 Surface analysis I
14	4/29	Surface analysis II: Operation	Bolstad, Ch. 11	
	4/30, 5/1			Lab 5.2 Surface analysis II
15	5/6	Advanced Topics & Conclusions		
	5/7,8			<b>Homework 5 due 5/7,8;</b> NO LAB
16	5/13	NO CLASS; READING DAY		
		<b>Exam II: TBA</b>		

- Notes:** 1) Lab exercises and homework assignments will be distributed at the beginning of lab.  
 2) As a non-standard course, the date of Exam II will be determined by the University until mid-semester.

## Grading

My baseline grade for the course, which assumes that you complete the work in good faith, on time, with serious effort, and with a certain degree of success, is a "B." To do better, you need to give something extra; to do worse, you need to give something less.

The numeric points of student's work will be evaluated as:

Assignment Type	Number of Assignments	Points Per Assignment	Total Points (100)
Homework 1, 2, 3, 4, 5	5	10	50
Exam I, II	2	23	46
Lab attendance (taken for every lab, overall attendance evaluated)	11	N/A	4

The final letter grade is based on the calculated numeric points in the above table, and will be graded as (with variations): A: 85.0-100, B:75.0-84.9, C:60.0-74.9, D:55.0-59.9, F:<55.0.

## Academic Honesty

Within our class, students may work together on homework assignments, however, each student absolutely must turn in their own work, and any work must be theirs alone. The University of Maryland, College Park has a nationally recognized **Code of Academic Integrity**, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. For more information on the Code of Academic Integrity or the Student Honor Council, please visit <http://www.shc.umd.edu>.