

# GEOG 3561/5561: Principles of Geographic Information Science Fall 2014

v1.5

## General information:

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## Lecture:

Section 001      Tuesday, Thursday      6:00–7:15 pm      West Bank Union Auditorium

## Lab:

Section 002	Tuesday	7:45–9:45 pm	Blegen 455	Alex
Section 003	Wednesday	10:10 am–12:05 pm	Blegen 455	Alex
Section 004	Monday	3:35–5:30 pm	Blegen 440	Ben

*Note about contacting us: e-mail is the most effective way to reach us outside of our office hours. **Make sure to include the course number (Geog 3561 or 5561) in the subject line of the e-mail or it might be passed over.***

## Course materials:

- Bolstad, P. (2012). GIS Fundamentals: A first text on Geographic Information Systems. 4<sup>th</sup> edition. Eider Press. White Bear Lake, MN.
- Personal USB “thumb” drive (512MB minimum) to store and back up projects.<sup>1</sup>
- Pack of 3” x 5” index cards from the U of M Bookstore.

## Course website:

- <https://ay14.moodle.umn.edu/my/>

## Course prerequisites:

- Junior standing for 3561
- Graduate standing for 5561
- No other previous experience with geography or GIS is necessary

## Course objectives:

This course will introduce the fundamental concepts of geographic information systems (GIS) and geographic information science (GIScience). In addition, it will introduce two of the several powerful GIS packages on the market, that is, ArcGIS from Environmental Systems Research

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<sup>1</sup> You may have limited space on the department’s server for your files. Note that your files, if stored locally, might be erased at specific times without warning. An inability to access files or files that are “lost” or “corrupt” is not a sufficient excuse for missed work. The use of a portable and personal USB drive is highly recommended.

Institute (ESRI) and IDRISI, from Clark University. By the end of the course, you will be equipped to:

- Understand the tools of a GIS and be able to explain and use them
- Locate, import, manipulate, and display geographic information in a GIS
- Describe and engage in the core debates and themes in geographic information science

### Grading strategy and policy:

We will evaluate you on the basis of your performance on nine 20-point labs (about one per week), two lab practicals, two midterm exams, and a final exam. The point distribution is as follows:

Labs (x9; 20 pts.)	180	(~40%)
Lab practicals (x2)	40	(~ 9%)
Midterms (x2)	130	(~30%)
Final exam	100	(~21%)
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<b>TOTAL</b>	<b>450</b>	<b>(100%)</b>

Make-up exams will only be given in special circumstances. Prior notice of the make-up must be given at least one week in advance of the exam. In the case of severe illness on an exam day, a doctor's note must be provided and a different exam will be given as soon as physically possible.

#### *Extra credit*

You will have the option of completing a lab exercise on digital terrain modeling for extra credit. The extra lab assignment is worth 20 points (see the lab schedule for the due date).

### Grading Scale

Grade	Percentage of Total Points	University definition of grade points and achievement
A	94-100	Represents achievement that is outstanding relative to the level necessary to meet course requirements.
A-	90-93	
B+	87-89	
B	83-86	Represents achievement that is significantly above the level necessary to meet course requirements.
B-	80-82	
C+	77-79	
C	73-76	Represents achievement that meets the course requirements in every respect.
C-	70-72	
D+	67-69	
D	60-66	Represents achievement that is worthy of credit even though it fails to meet full the course requirements.
F	<60	Represents failure and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded and I.

S		Represents achievement that is satisfactory, which is equivalent to a C- or better.
N		Represents no credit and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I.

## Lab goals and policies:

The goal of the lab section is to build and reinforce GIS concepts introduced in lecture, by building understanding and expertise in ArcGIS and IDRISI software. **Each lab builds upon the previous lab, so it is most important to avoid falling behind.**

### *Software availability*

It is highly recommended that you work on and complete the lab assignments in the lab period and in the department computing labs. Because ArcGIS is a very large software package, it requires substantial amounts of memory and disk space and is not recommended for your personal computers and laptops.

### *Assignments*

Each week, your TA will give you a set of “deliverables” for the lab. **These will be uploaded to the Moodle site by the beginning of the lab class.** Lab assignments are due before the start of lab the following week. Do not work on the previous week’s lab during lab time. Late work will be accepted, but at the price of a penalty of 10% per business day of being late (starting at the beginning of your lab). For example, if your 20-point assignment is due on Monday at 3:35pm and it is turned in at 6:00pm of the due day, the most you can get is 18 points. If you turn in your lab assignment at 4:00pm of the following day, it is considered two days late, which provides for a maximum score of 16 points.

### *Readings*

**Weekly readings that cover and supplement the lecture material will be announced during lecture (or on Moodle, if necessary).** Since the content and depth of the textbook that we are using might in some cases go beyond what is covered in the lecture, I suggest that you work through the appropriate passages after having attended the lecture, rather than beforehand.

### *Lab practicals*

There will be a midterm and final lab “practical.” These will be unscripted, timed assessments of your knowledge of and skills with ArcGIS which you have acquired in the lab exercises in the weeks prior to the lab practical. The lab practicals are worth 20 points each.

## Course policies

### *Attendance expectations*

I will not be taking attendance in lecture, but I will have a good sense of who is and who is not there. Many studies on instructor-led learning point out that the performance of a student is directly related to his/her attendance in class. You will learn more and boost your grade. This holds true for both the lecture and the lab. Attending the lab and keeping up with the lab

assignments are critical to succeeding in the course.

Powerpoint slides will be available on the Moodle site. However, it is unlikely that they will be on line before class. In addition, we cover much in class that is not easily visible on the slides without also attending class. Online slides, thus, are by no means a substitute for attendance at lecture.

#### *Electronics and distractions during lecture*

If you have a particular need for an electronic aid because of a disability, you can talk to me about it and clear its use. Generally, electronic devices are an unnecessary distraction to not only you but to those around you and the lecturer, so put them away.

Please refrain from eating during the lecture. I realize that this class occurs during dinnertime for some of you, but in addition to being a distraction for the surrounding students, the rapid proliferation of food allergies, particularly peanuts, can lead to a serious and urgent problem in such a class setting.

If you need to leave lecture early, it is appropriate to let me know in advance, and sit near the back of the room in order to leave unobtrusively. If you must arrive to class late, please do not create a commotion—slip in and sit in the back.

#### *Academic dishonesty*

In a lab class such as this, it is not unlikely for groups to work together, which may result in turned in assignments that look all too similar. It is your responsibility to ensure that labs done in groups clearly show your individual work, leaving no doubt that each of you completed all the work as assigned. Copying another person's work, either in the class or from another class, and turning it in as your own work, or sharing your work knowing that another student will be turning it in as his or her own work, constitutes academic dishonesty.

Academic dishonesty may result in a minor penalty (a zero for that week's assignment, for example) or a major penalty (an academic dishonesty failure for the course and/or referral to the Dean for further disciplinary actions), at the discretion of the instructor or TA.

The university has a specific code of conduct regarding academic dishonesty. If you have not looked lately or at all, it is wise to familiarize yourself with it:

[http://www1.umn.edu/regents/policies/academic/Student\\_Conduct\\_Code.html](http://www1.umn.edu/regents/policies/academic/Student_Conduct_Code.html)

A FAQ for academic dishonesty can be found at:

<http://www1.umn.edu/oscai/integrity/student/index.html>

#### *Sexual Harassment*

"Sexual harassment" means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in this course or at the University.

#### *Equity, Diversity, Equal Opportunity, and Affirmative Action*

The University will provide equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. Preventing equal access to learning for all is grounds for dismissal from the class.

#### *Disability Accommodations*

The University is committed to providing quality education to all students regardless of ability. Determining appropriate disability accommodations is a collaborative process. You as a student must register with Disability Services and provide documentation of your disability. The course instructor must provide information regarding a course's content, methods, and essential components. The combination of this information will be used by Disability Services to determine appropriate accommodations for a particular student in a particular course.

#### *Mental Health Services*

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. University of Minnesota services are available to assist you, and your instructor and TAs are trained to help you adapt and succeed.

## Lecture Schedule

day	lecture topics		
Sept.	2	Course intro + GIS and GIScience	Chapter 1, pp. 1-21
	4	Representations and data models	Chapter 2
	9	Vector data model	
	11	Raster data model I	
	16	Raster data model II	
	18	GIS data input and acquisition	Chapter 4, pp. 131-152
	23	Geodesy, projections, and coordinate systems I	Chapter 3
	25	Geodesy, projections, and coordinate systems II	
	30	Geodesy, projections, and coordinate systems III	
	2	Data standards, quality, error, and scale	Chapter 14, pp. 561-575
7	Review; GIS history	-----	
9	<b>EXAM 1: Lectures and readings through Oct. 8</b>	-	
Oct.	14	Transformations, remote sensing, and GIS I	Chapter 4, pp. 153-161
	16	Transformations, remote sensing, and GIS II	Chapter 4, pp. 162-175 Chapter 6, pp. 225-227
	21	Raster classification and interpretation	Chapter 6, pp. 250-265
	23	Computer classification	Chapter 6, pp. 223-230 Chapter 6, pp. 233-235
	28	Raster analysis foundation: Map Algebra	Chapter 10
	30	Vector data topology	Chapter 1, pp. 38-43
	Nov.	4	Data management and attribute tables in GIS
6		Vector processing: Joins and queries; spatial joins	Chapter 8, pp. 321-331
11		Review; spatial join wrap-up	-----
13		<b>EXAM 2: Lectures and readings through Nov. 12</b>	
18		Vector analysis; spatial analysis I	Chapter 9, pp. 347-389
20		Network analysis; 3D GIS	Chapter 9, pp. 390-398 Chapter 11, pp. 443-445
25		3D GIS; spatial interpolation and prediction	Chapter 11, pp. 458-465 Chapter 12, pp. 473-487
27		<i>No lecture – Thanksgiving</i>	
Dec.	2	Grad student presentations	-----
	4	Grad student presentations	-----
	9	Grad student presentations and review	-----
	16	<b>FINAL EXAM (6:30 PM – 8:30 PM)</b>	

## Lab Schedule

week of...	assigned	lab due	points
Sept.	2	No lab meeting – Labor Day	-
	8	No lab meeting	-
	15	1: ArcGIS Intro I: The first steps	-
	22	2: ArcGIS Intro II: Spatial data acquisition	1
	29	3: Coordinate systems and projections	2
Oct.	6	4: Georeferencing	3
	13	Lab Practical Review Session I	4
	20	<b>In-class Lab Practical I, labs 1 through 4</b>	-
	27	5: Land use classification with IDRISI	-
Nov.	3	6: Raster processing with IDRISI	5
	10	7: Vector processing	6
	17	8: Fuzzy suitability analysis	7
	24	9: Address matching and geocoding	8
Dec.	1	Lab Practical Review Session II	9
	8	<b>In-class Lab Practical II, labs 7 through 9</b>	***
TOTAL points for lab section			220

*Extra credit*

\*\*\*10: Digital terrain modeling (20 points); due on Dec. 13 (note: late submissions of the extra credit lab assignment will not be accepted!)