GEO 241: Geographic Information Systems I

Autumn 2011-2012
Department of Geography (see Appendix A for learning goals in p. 5)
DePaul University

1. Meeting

Time: Tue/Thu 1:00-2:30 PM
Location: Schmitt Academic Center 224 (GIS Lab) in Lincoln Park Campus (LPC)

2. Instructors

Sungsoon (Julie) Hwang

- Contact: shwang9@depaul.edu or (773) 325-8668
- Office: Room# 4513, 990 W Fullerton Ave at LPC (across Dominick)
- Office hours: Mon/Wed 1-2 pm in my office, or by appointment

Matt Berggren (Lab assistant)

- Contact: matthewberggren@gmail.com
- Lab hours: Tue/Thu 4:20-5:50 pm in GIS lab

3. Course Description

GEO241 is an introductory-level GIS course. The course covers the fundamentals of GIS.Topics include GPS, remote sensing, data models (vector and raster), coordinate systems, and map design. Instruction is accomplished through lectures and hands-on computer lab exercises using ArcGIS 10.

Prerequisite(s): LSP 120 (Mathematical and Technological Literacy) or HON 180 or an instructor's consent.

Learning domain: GEO241 fulfills Scientific Inquiry requirement (see Appendix B for learning outcomes in p. 6) of DePaul's Liberal Studies Program (LSP).

4. Course Text(s) and Reading(s)

Required text: *Geographic Information Systems & Science* (2011) Third Edition by Paul A. Longley, Michael F. Goodchild, David J. Maguire and David W. Rhind, Wiley – available at college bookstore.

Additional readings are available in pdf files at D2L (d2l.depaul.edu) > Content > Readings. Readings are sorted in the order of class schedules shown in Section 6.

5. Learning Goals

- Recognize the potential of GIS;
- Understand characteristics and role of data model in GIS;
- Understand how Earth coordinate systems are defined;
- Comprehend the basic components and operations of Global Navigation Satellite System (GNSS), including the Global Positioning System (GPS);
- Understand principles of remote sensing;
- Understand the nature and design principles of cartographic maps.

6. Outlines of Topics & Tentative Schedules

Date	Topics	In-class activities
09/08	Course overview	
09/13	1. Introduction to GIS	1. Classifying geographic problems
09/15	2. Survey of GIS	
09/20	3. Introduction to ArcGIS	2. Introducing ArcGIS*
09/22	4. Spatial data model	3. Exploring geographic data*
09/27	5. Attribute data model	4. Working with attribute tables*
09/29	6. Datum and map projections	5. Classifying map projections
10/04	7. Geospatial coordinate systems	6. Changing coordinate systems*
10/06	**Midterm**	
10/11	8. Global Navigation Satellite System	7. Collecting data with GPS
10/13	9. Remote Sensing	8. Classifying remotely sensed image
10/18	10. Map reading	9. Reading cartographic maps
10/20	11. Map design	10. Making thematic maps*
10/25	12. Map critique	
10/27	Project help	1. Normalizing a flat file*
11/01		2. Geocoding TRI data*
11/03		3. Making toxic maps*
11/08		4. Census mapping* (optional)
11/10		5. Spatial analysis* (optional)
11/15	**Final**	
11/17	**Project report** by 2pm on D2L	

***** are lab activities aimed at developing basic ArcGIS skills.

7. Learning Outcomes

At the completion of GEO241, you should be able to

- Articulate the utility of GIS given an application area;
- Assess strengths and weaknesses of GIS data models given a geographic situation;
- Use common geospatial coordinate systems appropriately, such as geographic (latitude and longitude), Universal Transverse Mercator and State Plane coordinates;
- Collect earth coordinates using a GPS receiver while recognizing sources of positional errors;
- Differentiate the several types of resolution that characterize remotely sensed imagery, including temporal, spectral, and spatial resolution;
- Classify geospatial products in terms of types of data capture methods, and identify sources of uncertainty;
- Read cartographic maps in an informed manner, including map scale, map projection, and cartographic abstraction;
- Employ cartographic design principles to make maps suited to a given problem;
- Critique the design of a given map in light of its cartographic rules, audience, and purpose;
- Develop basic ArcGIS 10 skills, including navigating geographic data, working with attribute tables, and making maps.

8. Grading Scheme

Grading Breakdown	
Participation	**13%**
10 Activities (each 3 pts)	**30%**
3 Homework (each 4 pts)	**12%**
Project report	**15%**
Exams (midterm 10%, final 20%)	**30%**

Grading Scale			
A	**= 93-100%**	**C+**	**=77-79.99%**
A-	**= 90-92.99%**	**C**	**=73-76.99%**
B+	**= 87-89.99%**	**C-**	**=70-72.99%**
B	**= 83-86.99%**	**D+**	**=60-69.99%**
B-	**= 80-82.99%**	**D**	**=50-59.99%**
		F	**=0-49.99%**

Participation: Your participation will be mainly evaluated based on attendance, preparedness, and contribution to discussion. To help you prepared for in-class discussions, assigned readings and learning objectives for each module will be posted on D2L announcement ahead of class.

Activities: These will be completed in class when instructors are present under most circumstances. Some activities are group work while ArcGIS lab tutorials are individual works. If you can't complete labs in class, you can finish them during lab hours with the help of a lab assistant. You can send an email to instructors if you encounter any problems while you work on labs outside of class.

Homework: Homework will be completed outside of the class individually.

- HW1 (GIS Case Studies): investigate an area of GIS application that interests you, and write summary/reflection report
- HW2 (GIS Data Models): compare and contrast vector and raster in encoding spatial aspects of the real world, and discuss utility and limitations of spatial data modeling
- HW3 (GIS Data Collection): classify USGS geospatial data products in terms of type of data capture methods, and identify sources of uncertainty

Project: Towards the end of quarter, you will be guided to make maps showing spatial variation of toxic chemicals released in your home county using GIS. At the end of the quarter, you should turn in a paper that summarizes spatial distribution of toxic emission in reference to maps you made, and describes processes you went through.

Exam: Midterm covers the first half. Final is a comprehensive exam. Both are closed-book written tests. Final will be held in the last day of the class, not during a final week.

Late Work Policy: Late work will be accepted with 10% of the total grade deducted for each day being late. Extensions, if needed, should be requested via an instructor' consultation in a timely fashion, and can be granted at an instructor'discretion. This policy applies to labs and project only.

Makeup Exam/Incomplete Grade Policy: A makeup exam or an incomplete grade can be arranged or granted only when credible dire and documented medical or family situations arise and these circumstances are communicated in a timely fashion.

Attendance/Absentee Policy: Consistent with university's policy, all students are expected to attend class meetings.Unless absence is explained on medical or compassionate grounds (documentation is required), absence from any classes is grounds for a grade adjustment.

9. Frequently Asked Questions

A. Where and when can I use GIS software on campus?

Name	Location	Open Hours
GIS Lab	SAC 224	qrc.depaul.edu > Hours
QRC Lab	SAC 268	qrc.depaul.edu > Hours
Richardson Library	2350 N Kenmore	library.depaul.edu > Hours

Be advised that GIS lab and QRC (Quantitative Reasoning Center) lab are occupied by quantitative reasoning classes, so open hours will be limited. I recommend that you check open hours at QRC website (qrc.depaul.edu) before your visit or work in Richardson Library when GIS lab or QRC lab is closed.

B. I want to have ArcGIS 10 installed in my personal computer. What are options?

You can order 60-day evaluation copy free of charge at www.esri.com/software/arcgis/arcview/eval/evalcd.html**.**

You can buy GIS manual type of books published by ESRI press, which usually come with 180 day evaluation copy. For ESRI books, go to ESRI Press website.

You can also purchase a single-use ArcGIS. Be sure to ask student discount as you (as students enrolled in university with ESRI license) are eligible for it.

C. I think I left my USB drive in GIS lab. What should I do?

It's most likely that your flash drive is at QRC provided that it's not stolen. Contact QRC (open 8 to 9) by phone (773) 325-4663 to check out if they may have it. They sometimes email you if they find lost USB drives. I recommend that you leave your contact information (e.g., Open If Lost.txt) at the root directory in your USB drive so that contact information can be retrieved swiftly.

D. I heard about GIS certificate program, how should I proceed to pursue certificate?

Check out http://las.depaul.edu/geography/Programs/CertificateInGIS/index.asp for information you should know. Feel free to consult your instructor.

10. Miscellaneous

Academic Honesty and Plagiarism: Academic honesty and integrity are expected at all times. Academic dishonesty, such as cheating or copying during exams, will be punished severely. Plagiarism – using someone else's work without acknowledgment and, therefore, presenting their ideas or quotations as your own work – is strictly forbidden. DePaul University officials will be informed of any instance of academic dishonesty and notification will be placed in your file. Please read the DePaul Academic Integrity Resources page (http://academicintegrity.depaul.edu/Resources/index.html) for definitions and explanations of plagiarism and the University's Academic Integrity expectations for students. Cutting and pasting text taken directly from a web-site without appropriate referencing and quotation marks is plagiarism and is forbidden. Submitting

work that has any part cut and pasted directly from the internet is grounds for an automatic grade of zero.

Accommodations: Any student who requires assistance is asked to contact the University's Office of Students with Disabilities (Phone 773/325-1677, TTY 773/325-7296, Fax 773/325-7396,http://studentaffairs.depaul.edu/studentswithdisabilities).They will be able to assist both student and faculty. If you have a condition that requires accommodation from the Productive Learning Strategies program (PLuS Program) please contact them at the Student Center room 370 (Phone 773/3251677 or online: http://studentaffairs.depaul.edu/plus/

University Center for Writing-Based Learning: Collaborates with writers from all disciplines, backgrounds, levels of expertise, and roles within the University community. Their goal is to help develop better writers along with better writing and reflection through continual revision. If you need assistance with writing assignments, they can be contacted at: 773.325.4272 (LPC) or wcenter@depaul.edu

Appendix A. Department of Geography Learning Goals--relevant ones are highlighted below:

Courses in the Department of Geography teach students:

1. **Understand spatial patterns and processes of modification of the Earth's physical and cultural landscapes**
   (a) As social constructions.
   (b) As systems that link the Earth with human society in interdependent, dialectical relationships, and
   (c) **Through mapping and visualization**.
2. **Understand the concept of scale as a spatial phenomenon that ties the local, the regional, the national, the transnational, and the global in a system of interaction.**
3. Understand the phenomenology of the discipline of Geography—most importantly, "space", "place", "landscape," "region," and "location".
4. Distinguish that spaces, places, and so on, may have both objective and subjective/symbolic dimensions.
5. **Develop research and writing competences that would allow you to:**
   (a) Formulate a cogent research question about the spatial character of a physical, socio-cultural, or environment-societal phenomenon,
   (b) **Write about it in ways that reflect analytical and critical thinking**, and
   (c) **Ethical concern over social and environmental justice, consistent with the University's social mission.**
6. **Engage competently in** qualitative and **quantitative spatial analysis**, and with exercises that are concerned with explaining spatial regularities (for example, the spatial calculus behind the location of retail commerce in Chicago, or transnational flows of capital).
7. **Learn the basic utility and use competently one or more of the information technologies that are now redefining the logistical limits of spatial analysis: geographic information systems (GIS) and remote sensing.**
8. Achieve greater general knowledge of the world, its regions, its physical systems, its cultures, and political-territorial divisions.

Appendix B. Learning Domain: Scientific Inquiry

Courses in the Scientific Inquiry domain are designed to provide students with an opportunity to learn the methods of modern science and its impact on the world around us. Courses are designed to help students develop a more complete perspective about science and the scientific process, including: an understanding of the major principles guiding modern scientific thought; a comprehension of the varying approaches and aspects of science; an appreciation of the connection among the sciences; the fundamental role of mathematics in practicing science; an awareness of the roles and limitations of theories and models in interpreting, understanding, and predicting natural phenomena; and a realization of how these theories and models change or are supplanted as our knowledge increases. Every course at DePaul must meet standards outlined by the Liberal Studies Council. Learning domain courses should demonstrate at least one learning outcome listed below

Learning Outcomes – relevant ones are highlighted

1. Students will understand the major principles guiding modern scientific thought. Students will demonstrate a mastery of the science content knowledge of their SID courses.
2. Students will know that science, technology, and math serve as mechanisms for inquiry into the nature of the universe. Students will:
    a. Identify questions that can be answered through scientific investigations
    b. Design and conduct a scientific investigation to test a scientific hypothesis
    c. **Use appropriate tools and techniques to gather, analyze, and interpret data to support or refute a scientific hypothesis**.
    d. **Develop descriptions, explanations, predictions, and models using evidence**.
    e. **Describe relationships between evidence and explanations using critical and logical thinking.**
    f. Recognize and analyze alternative explanations and predictions
    g. Communicate scientific procedures and explanations.
    h. Use mathematics in all aspects of scientific inquiry.
3. Students will understand and appreciate the interrelationships among science, technology and math. Students will:
    a. Use technology and mathematics to identify a problem or design a solution to a problem.
    b. **Give examples of how science and technology inform and influence each other**.
4. Students will understand and appreciate the role of science in society and in their lives. Students will:
    a. **Provide examples of how science and technology impact our lives, and how social needs and concerns impact our development of technology and scientific investigation**.
    b. **Develop positive attitudes towards science, technology, and mathematics**.
    c. Establish an ongoing experiential/service-learning interest in science, technology, and mathematics.
5. Students will understand the nature of science, technology, and mathematics. Students will:
    a. Provide examples of the abuse of science, including the representation of unfalsifiable claims as science and other forms of pseudoscience.
    b. **Explain the strengths and limits of scientific inquiry**.
    c. **Explain the difference between evidence and inference, and the provisional nature of scientific explanations by providing examples of how our understanding of the workings of the world has changed in the past**.
    d. Explain the difference between probability and certainty, and describe what is meant by uncertainty in the context of science, technology, and mathematics.

Writing Expectations: Writing is integral for communicating ideas and progress in science, mathematics and technology. The form of writing in these disciplines is different from most other fields and includes, for example, mathematical equations, computer code, figures and graphs, lab reports and journals. Courses in the SI domain must include a writing component where that component takes on the form appropriate for that course (e.g. lab reports, technical reports, etc.)