

GEO242 (GIS II: Community GIS)

Winter Quarter 2013 | Department of Geography | DePaul University

Time: Mon/Wed 11:20 am -12:50 pm

Location: SAC 224 (GIS Lab), LPC

1. Instructors

- Instructor: Sungsoon (Julie) Hwang (home page: <http://gis.depaul.edu/shwang/>; email: shwang9@depaul.edu; phone: (773)325-8668; office: 990 W Fullerton Room# 4513; office hours: Tue/Thurs 1:30-3 or by appointment)
- Teaching assistant: Xhoana (Ana) Ahmeti (email: xhoanahmeti@gmail.com; lab hours: TBA)

2. Course Description

GEO242 is an intermediate-level GIS course. Students will work together as a group to conduct GIS project for community-based organizations (CBO) in Chicagoland following best practices of project management. GEO242 focuses on understanding how GIS is used in organizations, and developing geographic database. Major topics include GIS needs assessment, spatial database design, data collection, geospatial data quality, and spatial analysis. The class is conducted through lectures, group discussion on project, and hands-on lab activities using ArcGIS 10.1. Prerequisite is GEO241 or instructor's consent.

3. Learning Goals

- Discern the interplay between GIS and organization by observing how geographic information needs (GIN) arise in organizational contexts, and helping community organization to meet GIN using GIS tools
- Get versed in constructs of database design for GIS, including entity-relationship modeling, relational schema, and geodatabase
- Grasp GIS data collection processes from primary data capture (e.g., GPS), and secondary data capture (e.g., digitizing) to data transfer (e.g., attribute data import) by developing GIS database on your own
- Understand elements related to data quality, including resolution, accuracy, completeness, and consistency
- Comprehend how basic methods of spatial analysis—including query, measurement, buffering, vector overlay, and raster overlay—work, and when to use them

4. Learning Outcomes—After completing all requirements of GEO 242, you should be able to

- Assess geographic information needs, and design information products related to GIS given an organizational context
- Design database using entity-relationship modeling techniques, and present the database design in entity relationship diagram (ERD) linked to relational model
- Develop geodatabase by applying data collection techniques, including GPS data import, heads-up digitizing, coordinate transformation, geocoding, and topology validation
- Assess the fitness for use of data by checking components of spatial data quality, including calculating measures of accuracy
- Conduct basic spatial analyses appropriate for a given problem, including query, spatial join, buffering, and overlay in both vector and raster environments

5. Course Readings and Required materials: No text. All readings in PDF are posted on D2L. USB drive.

6. Course Outlines and Tentative Schedules

Date	Topic	In-class activities	Test	Project
1.07	Course overview	Meet with CBO representatives		
1.09	1. Project management	1. Write the Statement of Work in group		
1.14	2. Managing GIS	2. Prism mapping (data classification)		P0
1.16	3. Needs assessment	3. Change mapping (table manipulation)		
1.21	4. Database design	4. Draw ERD in MS Visio		
1.23	5. Data collection: primary	5. Import GPS data in DNR GPS	T1	
1.28	6. Data collection: secondary	6. Digitizing & coordinate transformation		
1.30	7. Data collection: data transfer	7. Import a flat file in MS Access		P1
2.04	Meet with CBO reps. 8. Data collection: geocoding	8. Geocoding, merging, and adding extended capabilities to geodatabase		
2.06	9. Data quality	9. Calculate Root Mean Square Error		
2.11	10. Basic spatial analyses	10. Conduct spatial query & spatial join	T2	
2.13		11. Conduct vector suitability analysis		
2.18		12. Conduct raster suitability analysis		
2.20	Project			P2
2.25	Project		T3	
2.27	Reflection/Project			
3.04	Project			P3
3.06	Project			
3.11	Project	Map contest (submit a map for feedback)		P4
3.13	Project			
3.20	Presentation before CBO reps. (11:45-2:00 pm)			P5; P6

7. Grading scheme

Components	Points (/100)	Description
Activities	24	Each is worth 2 points
Tests	20	Two written tests (T1, T2) and one practical test (T3)
Participation	10	Attendance, class participation, and group discussion
Project	40	Consists of six project milestones
Peer review	6	Based on evaluation form filled out by peers in your project group

Activities: Learn GIS skills. Activities will be completed individually (except for #1) in class when instructors are present under most circumstances. If you can't complete activities in class, it is expected that you will complete them on your own after class—go to library or work with a lab assistant during lab hours in GIS lab. Unless noted otherwise, activities are due on D2L in a week from the data activities are handed out.

Tests: Three tests will be held. Test 1 covers modules 1 to 4, and test 2 covers modules 5 to 9. These two tests are written tests, and are worth 6 points, respectively. Test 3 (worth 8 points) evaluates practical GIS skills drawing from in-class activities. With test 3, you will perform specified tasks without instruction. All tests are closed-book while you're allowed to refer to ArcGIS help for the practical test.

Participation: Grade will be assigned according to the criteria below.

- A (9 - 10) = Student is present in all or nearly class meetings, and prepared, at all times, to respond to questions. Student is an active participant in small group activities, in and out of class, and in class-time activities stays on task.
- B (8 - 9) = Student participates as above, 75% of the time.
- C (6.5 - 8) = Student does not volunteer comments; responses demonstrate vague familiarity with course readings. Student is a passive member of small group activities and/or does not stay on task during class-time activities.
- D (5 – 6.5) = Student never volunteers, cannot respond to direct questions, keeps silent during class discussions and is unable to summarize readings if asked.
- F (0-5) = Student misses many class sessions and/or sits silently in classes when present, or is disruptive and non-participatory in the classroom.

Project: A group of 3-5 persons will work together throughout the quarter in and outside of the classroom to achieve goals that groups set out to accomplish in collaboration with CBOs that groups work for. Project is broken down to the six milestones as follows.

Milestone	Points	Description
P1 (needs assessment)	4	Assess geographic information needs by defining goal, objectives, and information products
P2 (system requirements)	4	Specify data and processing requirements
P3 (data acquisition)	4	Acquire or create data, and assess data quality in addition to describing characteristics of data
P4 (data analysis)	4	Lay out the plan for data analysis and map design
P5 (presentation)	4	Present results to clients; submit a presentation file
P6 (final report)	20	Final report consists of introduction, P1, P2, P3, P4, results and conclusion. Incorporate any feedback into a final report; Submit a document file and source/output data

Peer review: towards the end of the quarter, you will receive a survey that asks you to assess your peers' contribution to the project. Your grade will be assigned based on peer reviews after consistency is checked.

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

Late Work Policy: Late work will be accepted with 20% of the total grade deducted for each day being late. Extensions can be requested if needed, but will be only granted under understandable circumstances (e.g., clients did not provide data in time; you had to be in a funeral). This policy applies to activities 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.

8. Detailed plan of the class and readings

W1M (1/7) Course overview

Go over Syllabus on D2L

- Talk about the plan of the class
- Meet with all CBO representatives except for Lakeview Action Coalition
- Q & A after the talk

W1W (1/9) Module 1. Project management

Read Verzuh. 2008 *The Fast Forward MBA in Project Management*. Wiley: 13-14, 21-24, 6-9, 60-68, and 125-142.

- Meet with a representative of Lakeview Action Coalition
- Discuss why project fails, how to write the Statement of Work (SOW), and how the Work Breakdown Structure (WBS) works
- Get together with “tentative” group members to work on activity #1

W2M (1/14) Module 2. Managing GIS

Read Sieber. 2000. GIS implementation in the grassroots. *URISA journal* 12(1): 15-29.

Read ArcGIS 10.1 help on Classifying numerical fields for graduated symbology

- Discuss factors of successful GIS implementation in organizations (government to grassroots)
- Discuss pros and cons of standard data classification methods (e.g., quantile, natural breaks)
- Get together with group members to work on P0 (proposal). P0 is due on 1/16
- Do activity #2: make choropleth (graduated color) maps with different data classification methods using multiple data frames in ArcMap

W2W (1/16) Module 3. Needs assessment

Read Huxhold. 1992. Needs Assessment. In Brown and Moyer eds. *Multipurpose Land Information Systems: the Guidebook*. FGCC: 16-1~16-38

Read ArcGIS 10.1 help on Field data types

- Turn in **P0**. Group members are finalized with P0
- Discuss functional approach to needs assessment for single-purpose GIS project
- Go over P1 (needs assessment) and P2 (system requirement) guidelines
- Discuss appropriate use of different field data types (e.g., long, double)
- Get together with group members to make plans for P1
- Do activity #3: make a population change map using field calculation

W3M (1/21) Module 4. Database design

Read Shekhar and Chawla. 2003. Spatial concepts and data models, Chapter 2 of *Spatial Database: A Tour*. Prentice Hall: 34-41

- Learn the concept of entity-relationship modeling and draw entity-relationship diagram (ERD)
- Project group meeting for P1
- Do activity #4: draw ERD in MS Visio

W3W (2/23) Module 5. Data collection 1: primary data capture

Read Longley et. al. 2010. Data collection, Chapter 9 of *Geographic Information Systems and Science*. 3rd ed. Wiley: 229-243

- Take **test 1**

- Discuss appropriate use of color in thematic mapping based on activity #3
- Discuss typology of GIS data collection: primary vs. secondary data capture
- Do activity #5: go out and collect track log data with a GPS receiver, and import GPS track log data into GIS using DNR GPS (this is a freeware).

Note that activities from #5 to # 9 are built on previous activities. That is, you need data from activity #5 to do activity #6 and so on.

W4M (1/28) Module 6. Data collection 2: secondary data capture

Read Bolstad. 2008. Coordinate transformation, in Chapter 4 of *GIS Fundamentals: A First Text on Geographic Information Systems*. The 3rd edition. Elder Press: 146-155

Read ArcGIS 10.1 Help on spatial adjustment transformations

- Discuss appropriate use of coordinate system/map projection (e.g., UTM, SPC, GEO) based on activity #5
- Discuss different spatial adjustment (aka. coordinate transformation) methods (e.g., affine, similarity)
- Project group meeting for P1 (due 1/30)
- Do activity #6: perform heads-up digitizing and spatial adjustment

W4W (1/30) Module 7. Data collection 3: data transfer

Read U.S. Census Bureau. 2008. *A Compass for Understanding and Using American Community Survey Data: What General Data Users Need to Know*. US. Government Printing Office: Washington D.C.

Read ArcGIS 10.1 Help on geodatabase

- Turn in **P1** (needs assessment)
- Discuss appropriate use of American Community Survey
- Discuss essentials of geodatabase: how it is different from shapefile, three primary dataset types
- Discuss methods of, and issues in importing a flat file (e.g., csv, txt file) into GIS
- Project group meeting for P2
- Do activity #7: download a flat file from American Fact Finder and import data into a dBase file in MS Access

W5M (2/4) Module 8. Data collection 4: geocoding

Read Goldberg, Wilson, and Knoblock. 2007. From texts to geographic coordinates: the current state of geocoding. *URISA Journal* 19(1): 33-46

- **Meet with CBO representatives** (they are invited) to solicit feedback on P1
- Discuss how geocoding works, and errors involved in geocoding
- Project group meeting for P2
- Do activity #8: geocode street addresses, merge data, and add extended capabilities to geodatabase

W5W (2/6) Module 9. Data quality

Read Veregin. 2005. Data quality parameters, Chapter 12 of Longley, Goodchild, Maquire, and Rhind (Eds) *Geographic Information Systems: Principles, Techniques, Management and Applications*. The 2nd edition, Abridged. Wiley: 177-189

- Differentiate concepts related to data quality: accuracy, completeness, consistency, resolution, and currency (up-to-dateness)
- Learn how to measure accuracy (or error): Root Mean Square Error (RMSE), confusion matrix
- Do activity #9: calculate RMSE using data from activity #6

M6M (2/11, 2/13, 2/18) Module 10. Spatial analysis

Read Bolstad. 2008. Buffering & Overlay, in Chapter 9 of *GIS Fundamentals: A First Text on Geographic Information Systems*. The 3rd edition. Elder Press: 342-361

- Take **test 2** on 2/11
- Discuss appropriate use of buffering and overlay
- Project group meeting for P2
- Do activity #10: conduct spatial query (select by location) & spatial join (point-in-polygon overlay)
- Do activity #11: conduct suitability analysis (polygon overlay)
- Do activity #12: conduct suitability analysis (raster overlay) in Spatial Analyst

9. 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 Center for Students with Disabilities (CSD) (Phone 773/325-1677, TTY 773/325-7296, Fax 773/325-7396, <http://studentaffairs.depaul.edu/studentwithdisabilities>). 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

10. Department of Geography Learning Goals—GEO 242 addresses 1), 5), 6), and 7):

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.

11. Potential GIS Projects

- Latino Policy Forum (LPF): Latino (voting age) population by legislative districts in Illinois
- Latino Policy Forum: Mapping LPF’s community outreach efforts on fair housing in Chicago
- Latino Policy Forum: Foreclosure and Latino population in Chicago
- Universidad Popular (UP): Geographic reach of UP literacy programs and Little Village demographics
- Institute of Cultural Affairs (ICA): Mapping community-based green initiatives in Chicago
- Northwest (NW) Side Housing Center (NSHC): Migration of Latino/Polish immigrants in NW Chicago
- Lakeview Action Coalition (LAC): Mapping affordable housing in Chicago
- Lakeview Action Coalition: Geographic coverage of LAC members and coalition organizations

12. Partnering community-based organizations and their websites

- Latino Policy Forum: <http://www.latinopolicyforum.org/>
- Universidad Popular: <http://www.universidadpopular.us/>
- Institute of Cultural Affairs: <http://www.ica-usa.org/>
- Northwest Side Housing Center: <http://www.nwshc.org/>
- Lakeview Action Coalition: <http://www.lakeviewaction.org/>