

# **GEOG / IES / URPL / LA 532: Applications of Geographic Information Systems in Planning**

Fall 2019

University of Wisconsin – Madison

Canvas URL: <https://canvas.wisc.edu/courses/170143>

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**Lecture:** Tuesdays 11:00 am – 12:15 pm, 175 Science Hall

**Lab:** Thursdays 11:45 am – 2:15 pm; 380 Science Hall

**Office hours:** Thursdays 9:00 – 11:00 am and by appointment

## **Course Overview**

The nature of urban planning issues and practices are predominantly spatial. Thus, Geographic Information Systems (GIS), which enable planners to gather, store, manipulate, and analyze spatial data, have earned an important role among planners and policy-makers in recent years. GIS knowledge and skills have become an indispensable part of numerous planning jobs in both public and private sectors; indeed, on its website, the American Planning Association lists “mastery of geographic information systems software” as an important skill of successful planners. This course is designed to explore planning-related GIS data, applications, analytical tools, and issues and provide students with knowledge and skills they can use in a variety of planning-relevant positions.

## **Learning Objectives**

This course intends to give students a solid foundation on GIS principles and skills. It aims to provide students with the knowledge, skills, and values required for planning and related practice. More specifically, these knowledge, skills and values include the following:

Knowledge: As an outcome of this course, students are expected to develop a better understanding of how GIS is being and can be used in planning and related fields, and implementation issues in planning agencies and local governments. Students are also expected to be able to explain the nature, characteristics, and possible ways of analyzing spatial data relevant to planning and have heightened knowledge of effectively communicating geospatial data and analyses.

Skills: As an outcome of this course, students are expected to be able to obtain and analyze geospatial data using a range of spatial analysis techniques and tools for a number of planning-related practices (e.g., site selection, land suitability analysis). In addition, the students will further their written, oral, and graphic communication skills.

Values and ethics: As an outcome of this course, students will learn how not to lie with maps and consider ethical issues surrounding access and use of geospatial data.

### **Course requirements and format**

We will meet twice a week. For the most part, Tuesday meetings are designed as a combination of lectures, presentations, and discussion of assigned readings. In general, the discussions will be from the assigned readings, but you are encouraged to do further research, suggest other readings, and bring other material to class. Thursday meetings are designated for giving you hands-on experience with accessing, analyzing, and visualizing geospatial data relevant to planning. We will be primarily using ArcGIS in our course.

This 3-credit course is a lecture and lab course. Students will meet the 3 credits of the course by spending a total of 126 hours (42 hours per credit) on learning activities and working with the instructor. This includes scheduled lecture time (11:00 am – 12:15 pm, Tuesdays) and lab time (11:45 am – 2:15 pm, Thursdays), open lab time (8 am to 5 pm weekdays in M376 & 9 am to 5 pm Mondays through Thursdays and 9 am to 4 pm on Fridays in Map Library), and any additional time outside the classroom and the computer labs.

An introductory GIS class or experience using GIS is a pre-requisite for this class. If you feel that your knowledge or skills are rusty, the first couple of weeks' review time will be very beneficial to you. Please use this time wisely.

The students are expected to attend and participate in all class meetings, take a test, undertake a research assignment, and complete five lab assignments. Below, you will find more information on each of these requirements.

Course participation refers to all aspects of participation: attendance, and participation in questions and discussions. The emphasis of this requirement is on the quality and quantity of participation in class discussions. While most of the discussions will take place in our lecture sessions, they may not be restricted to the lectures alone, but could take place in the lab sessions. Please note that if you miss class, it is your responsibility to find out what you missed.

Exam: The aim of the exam is to ensure that you are able to synthesize the topics covered in the lectures related to applications and issues of GIS in planning.

If you have a conflict (e.g., religious observation, scheduled surgery, conference) with the date of the exam, you need to notify me within the first two weeks of the term so that we can arrange a different date for a make-up. If you miss the test without prior notification, you will need to provide proof (e.g., medical emergency) as to why you could not make it. If you need other special accommodations, please also let me know ahead of time.

Research assignment: A small research project is designed so that you will get further familiarity with how GIS is used in planning and related professions. The research assignment is about Web-based planning-relevant GIS applications or planning support systems. You will present your application in class and also submit a report. We will all be rating these presentations and graduate students will also be providing written feedback to undergraduate students and their graduate peers. I will be providing further guidance on the format of this assignment in the upcoming weeks.

Lab assignments: The course consists of five lab assignments emphasizing planning-related GIS applications and spatial data (one of the lab assignments may be substituted by a lab quiz depending on my assessment for such a need). The intent is for you to take the skills you learned / reviewed and apply them to different situations and datasets. Remember that while you may discuss these assignments with fellow students, you are expected to work on them individually unless otherwise noted.

The assignments are designed such that you can complete most of the work (if not all) during lab time. However, you are expected to be familiar with topics that the assignments will make use of. I will provide information on relevant topics ahead of time so that before coming to class, you can review material if you need to. If you have reviewed related topics and still find that you are spending significant amounts of time outside our lab meetings on the assignments, please talk with me and do not wait until the last minute to tackle the assignments. We will have lab time and office hours between when you receive the assignment and need to submit it, so take advantage of those times. You will have at least one week to complete the assignments.

### **Grading and Evaluation**

The students will be evaluated on all of the four course requirements described above. Course grades will be based on the following:

Course participation	10%
Exam	20%
Research assignment	10%
Lab assignments	60%

Final grades are assigned based on the following scale: 93-100 – **A**; 88-92 – **AB**; 83-87 – **B**; 78-82 – **BC**; 70-77 – **C**, 60-69 – **D**; and 0-59 – **F**.

Please note that:

- Attending all classes but not speaking up will result in loss of many points in your participation grade.
- The lab assignments will be evaluated based on both correct findings as well as the discussion of the findings. There may be other expectations in the assignments; I will provide information on these expectations. Each lab assignment will be worth between 10 and 15 points.
- Late submissions of lab assignments will be penalized by a point deduction each day that they are late; no late assignments will be accepted after a particular assignment has been graded and returned to students.
- Guidelines on presentation and report on the research assignment will be provided later in the term.

### **Course Material**

If you do not have one already, I recommend that you own a book on GIS fundamentals for your reference. Such a book could help you refresh and enhance your knowledge on the theoretical and conceptual background of GIS. There are some excellent texts. My first suggestion would be Bolstad's text (Bolstad, Paul. 2016 (5<sup>th</sup> ed.). *GIS Fundamentals: A First Text on Geographic Information Systems*; White Bear Lake, MN: Eider Press. The previous version (2012) would be just fine as well. For those needing a workbook on ArcGIS, I suggest an ESRI publication: Law, Michael and Amy Collins. 2018. *Getting to Know ArcGIS Desktop*, Redlands, CA: ESRI Press. A previous version of this book from ESRI Press

would be fine as well, but try to find a book that matches the version of ArcGIS that you have access to. These two texts and some others can be accessed at College Library's Reference desk. Several of the course materials can be accessed through CANVAS as well. CANVAS will be a primary source of information, where you will find assigned readings and assignments, and relevant information.

The chapters mentioned in the syllabus come from the following books:

- Bolstad, Paul. 2016 (5<sup>th</sup> ed.). *GIS Fundamentals: A First Text on Geographic Information Systems*; White Bear Lake, MN: Eider Press)
- Brail, Richard K. 2008 (ed.). *Planning Support Systems of Cities and Regions*. Hollis, NH: Puritan Press.
- Brail, Richard K. and Richard E. Klosterman. 2001 (eds.). *Planning Support Systems in Practice: Integrating Geographic Information Systems, Models, and Visualization Tools*. Redlands, CA: ESRI Press.
- Kimerling, A. Jon, Buckley, Aileen R., Muehrcke, Phillip C. and Juliana O. Muehrcke. 2016. *Map Use: Reading, Analysis, Interpretation*. 8<sup>th</sup> ed., Madison, WI: JP Publications.
- Maantay, Juliana and John Ziegler. 2006. *GIS for the Urban Environment*. Redlands, CA: ESRI Press.
- Monmonier, Mark. 1996 (2<sup>nd</sup> ed.). *How to lie with Maps*. Chicago, IL: University of Chicago Press.
- O'Looney, John. 2000. *Beyond Maps: GIS and Decision Making in Local Government*. Redlands, CA: ESRI Press.
- Law, Michael and Amy Collins. 2018. *Getting to Know ArcGIS Desktop*, Redlands, CA: ESRI Press.
- Robinson, Arthur, H., Morrison, Joel, L., Muehrcke, Phillip, C., Kimerling, A. Jon, and Stephen C. Guptill. 1995. *Elements of Cartography*. 6<sup>th</sup> ed., Hoboken, NJ: John Wiley & Sons.

### **Academic Integrity**

I expect high academic integrity from each student. I also expect that students to be familiar with the policies, definitions, and procedures regarding academic misconduct, as specified in UWS 14. Details of the policies, including your rights and responsibilities can be found at:

<https://conduct.students.wisc.edu/misconduct/academic-integrity/> Under the policies regarding academic misconduct, an instructor has discretion as to which penalties will be imposed in the case of academic misconduct. I reserve the right to assign a failing grade to a particular assignment, report the incidence to the Student Advocacy and Judicial Affairs office within the Dean of Students Office, or impose other penalties.

Please remember that cheating and using another person's ideas, words, or research, and presenting it as one's own by not properly crediting the originator (including the Web) are two common acts of academic misconduct.

### **Diversity and Inclusion**

Diversity is a source of strength, creativity, and innovation for UW-Madison. I value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

### **Name and Pronoun Use**

I will (and also expect class members to) honor the names and pronouns you provide and your request at any point to address you by your correct name and/or gender pronoun. If I make a mistake, please correct me without hesitation (in class or in private).

## **Special Accommodations**

The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform me of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. I will work either directly with you or in coordination with the McBurney Disability Resource Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA.

Similarly, please notify me within the first three weeks of the term with regards to specific dates on which you request relief for religious observation.

## **Civility in the Classroom**

I expect that you respect your classmates (especially those that are presenting), guest speakers, and instructor, and that you not engage in non-class e-activities (e.g., checking and responding to e-mail, texting, checking Facebook and Twitter) during our meetings. Engagement in non-class e-activities is impolite to both your classmates and your instructor, and is an impediment to your processing and retaining class-related information.

## **Course Schedule**

Please note that the schedule and readings are subject to changes as we progress in the term.

### Week 1: September 5

Lab: Introduction: Course overview; individual introductions; introduction to applications of GIS in planning; review of GIS fundamentals (characteristics and models of geospatial data, map projections and coordinate systems, geospatial data entry, relational DBMS, precision and accuracy)

### Week 2: September 10 - 12

Lecture: GIS Fundamentals (in ArcGIS) continued  
Readings: Maantay and Ziegler, part II (skim through to get an idea)  
<https://writing.wisc.edu/handbook/assignments/quoting/sources/>  
suggested: Bolstad, chapter 2, 3, 4, 8 (up to page 307)  
suggested: Kimerling et al., pp 19-98 (skim through if additional info needed)  
Review necessary chapters from Law and Collins  
Lab: GIS fundamentals in ArcGIS continued

### Week 3: September 17 - 19

Lecture: GIS Fundamentals continued  
Readings: Bolstad, chapter 7

Lab: Accessing planning-relevant spatial data, GIS fundamentals in ArcGIS continued  
Guest lecturer: Jaime Martindale, UW Robinson Map Library

Week 4: September 24 - 26

Lecture: Planning-relevant Spatial Data: Census and TIGER  
Readings: Monmonier, chapter 10  
Lab: Accessing and working with Census data

Week 5: October 1 - 3

Lecture: Spatial Analysis for Planners  
Readings: Bolstad, chapter 9 (and skim through 10, 11, 12, 13)  
Lab: Analyzing environmental justice issues in Dane County  
Due: Lab Assignment: Mapping Dane County Socio-demographic Characteristics

Week 6: October 8 - 10

Lecture: Spatial Analysis continued  
Lab: Analyzing environmental justice issues in Dane County  
Due: Lab Assignment: Assessing Environmental Justice Issues in Dane County

Week 7: October 15 - 17

Lecture: GIS and Mapping: Pitfalls for Planners  
Readings: Kent, Robert B. and Richard E. Klosterman. 2000. GIS and Mapping: Pitfalls for Planners. *Journal of the American Planning Association*, **66**:2, 189-198.  
Robinson et al., chapter 18 (chapters 19-26 are also good sources for map design)  
Lab: Site selection and map design

Week 8: October 22 - 24

Lecture: GIS in Planning: Applications, Opportunities, Threats, and Emerging Trends  
Readings: Dangermond, Jack. 2010. GeoDesign and GIS: Designing our Futures. Proceedings of Digital Landscape Architecture. 502-514.  
Drummond, William J. and Steven P. French. 2008. The Future of GIS in Planning: Converging Technologies and Diverging Interests. *Journal of the American Planning Association*. **74** (2): 161-173 (and responses by Klosterman and Ferreira – p. 174-179).  
Lejano, Raul P. 2008. Technology and Institutions: A Critical Appraisal of GIS in the Planning Domain. *Science, Technology, and Human Values*. **33** (5): 653-678. (skim through)  
Maantay and Ziegler, part II (select a chapter of interest)

Nedovic-Budic, Zorica. 2000. Geographic Science Implications for Urban and Regional Planning. *Journal of the Urban and Regional Information Systems Association*. **12** (2): 81-93.

Patterson, Mark W. and Nancy Hoalst-Pullen. 2009. Local Government Use of GIS in Comprehensive Planning. *Geotechnologies and the Environment*. 1: 205-220.

Slotterback, Carissa S., Runck, Bryan, Pitt, David G., Kne, Len, Jordan, Nicholas R., Mulla, David J., Zerger, Cindy, and Michael Reichenbach. 2016.

Collaborative GeoDesign to Advance Multifunctional Landscapes. *Landscape and Urban Planning*. 156: 71-80.

Lab: Site selection and map design continued & ArcGIS Extensions

#### Week 9: October 29 - 31

Lecture: (GIS-based) Planning Support Systems

Readings: Brail, chapters 1, 2, 10, 11

Brail and Klosterman, chapter 1.

Geertman, Stan and John Stillwell. 2004. Planning Support Systems: an Inventory of Current Practice. *Computers, Environment, and Urban Systems*. **28**: 291-310.

Vonk, Guido, Geertman, Stan, and Paul Schot. 2005. Bottlenecks Blocking Widespread Usage of Planning Support Systems. *Environment and Planning A*, **37**: 909-924.

Lab: Story maps

Guest lecturer: David Hart, UW – Sea Grant

Due: Lab Assignment: Residential Site Selection and Map Design

#### Week 10: November 5 - 7

Lecture: GIS Implementation & Issues for Planning Agencies

Readings: Esnard, Ann-Margaret. 2007. Institutional and Organizational Barriers to Effective Use of GIS by Community-Based Organizations. *Journal of the Urban and Regional Information Systems Association*. **19** (2): 13-19.

Göçmen, Z. Aslıgül and Ventura, Stephen J. 2010. Barriers to GIS Use in Planning: *Journal of the American Planning Association*. **76** (2): 172-183.

Innes, Judith, E, and David M. Simpson. 1993. Implementing GIS for Planning: Lessons from the History of Technological Innovation. *Journal of the American Planning Association*. **59**: 230-236.

O’Looney, chapters 10, 11

Lab: Student presentations on Web-based GIS or PSS, and working with ArcGIS online

Guest lecturer: Math Heinzl, GIS Specialist & ESRI Liaison, UW-Madison

#### Week 11: November 12 - 14

Lecture: EXAM

Lab: Spatial Analyst Extension  
Due: Web-based GIS / PSS report

Week 12: November 19 - 21

Lecture: GIS in Planning: Perspectives from the Public Sector  
Guest Lecturer: Curt Kodl, Dane County, Planning Department  
Lab: Introduction to Land Suitability Analysis  
Due: Lab Assignment: Planning-related ArcGIS Extensions

Week 13: November 26 - 28

Lecture: Public Participation and GIS in Planning  
Readings: Brown, Greg. 2012. Public Participation GIS (PPGIS) for Regional and Environmental Planning: Reflections on a Decade of Empirical Research. *URISA Journal*. **25:2** (7-18).  
Elwood, Sarah A. 2002. GIS Use in Community Planning: A Multidimensional Analysis of Empowerment. *Environment and Planning A*, **34**: 905-922.  
Schlossberg, Marc and Elliot Shuford. 2005. Delineating “Public” and “Participation” in PPGIS. *Urban and Regional Information Systems Association Journal*. **16** (2): 15-26.  
Talen, Emily. 2000. Bottom-Up GIS: A New Tool for Individual and Group Expression in Participatory Planning. *Journal of the American Planning Association*, **66** (3): 279-294.  
Lab: NO lab (Happy Thanksgiving!)

Week 14: December 3 - 5

Lecture: GIS in Planning: Perspectives from the Private Sector  
Guest Lecturer: Spencer Gardner, Toole Design Group  
Lab: Land Suitability Analysis

Week 15: December 10

Lecture: Reactions to GIS in Planning Practice; Land Suitability Analysis continued, course wrap-up  
Due: Lab Assignment: Land Suitability Analysis (4 pm, Friday December 13)