

**Resource Economics and Policy  
Applications of GIS**

**REP 497 Section 003**

**Fall 2003**

**Time:** Tuesday and Thursday; 9:30-10:45 AM

**Location:** Winslow 201 Classroom / Winslow 301 Computer Lab

**Prerequisites:** COS 100 or equivalent; MAT 215 or MAT 232 or equivalent.

**Instructor:**

Kathleen P. Bell, Assistant Professor  
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**Office Hours:**

Thursday 2:00 PM to 4:00 PM;  
Additional times are available subject to request.

**Course Objectives:**

The course has two objectives: (1) introduce basic geographic information system (GIS) and spatial analysis skills and (2) emphasize the significance of spatial data, GIS, and spatial statistics to the study of natural resource and environmental policy issues.

**Course Description:** The course is intended for undergraduate and graduate students who wish to develop GIS and spatial analysis skills in an applied, research-based learning environment. The course will emphasize social science applications of GIS, focusing largely on the interactions between humans and the natural environment. Students will learn basic data management and spatial analysis skills and be introduced to basic spatial statistics concepts. Students will become familiar with resource economics and policy applications of spatial data and will acquire experience working with spatially-explicit datasets commonly employed by policy analysts and economists. Policy-makers are increasingly using spatial data and spatial statistical methods to study policy issues and to design and evaluate public policies. Moreover, government agencies and other organizations are increasingly using GIS to share information with stakeholders and the general public. This course is intended to provide students with knowledge and skills applicable to this modern policy-making environment.

The course meets twice a week for 75 minutes. Lectures will be given during the Tuesday class session. Hands-on computer labs will be held during the Thursday class session. Students will be regularly asked to complete homework/lab assignments demonstrating their spatial analysis skills. The completion of these assignments will require students to work independently in the computer lab outside of these class sessions.

**Pre-requisites:** The course assumes satisfactory completion of an introductory statistics course (MAT 215 or MAT 232) and an introductory computer course (COS 100 series or equivalent). Basic computer skills will be assumed. Students are expected to understand Windows-based operating systems and to manage files and disk space responsibly. Experience working with Microsoft Word and Excel and SAS is not required but is helpful.

**Texts:**

Ormsby, T., Napoleon, E., Burke, R., Groessl, C., and L. Feaster. 2001. *Getting to Know ArcGIS Desktop*. Redlands, CA: ESRI Press; Book and CD-ROM edition.

Bolstad, P. 2001. *GIS Fundamentals: A First Text on Geographic Information Systems*. White Bear Lake, MN: Eider Press.

**Additional Reading Materials:** Additional, non-text reading materials will be assigned. Access to these materials will vary, including direct electronic access via the internet and paper access via binders stored in the computer lab and classroom. Refer to the detailed course schedule for more information on these readings.

**Grading:** Letter grades will be assigned based on the following class work:  
Homework/Lab Assignments 50%;  
Midterm Exam 20%; and  
Final Exam 30%.

**Homework/Lab Assignments:** There will be several homework/lab assignments during the semester. Typically, you will be given a week to work on the assignments. Assignments will be graded. Late homework will not be accepted unless its tardiness is authorized.

**Exams:** Examinations will test your knowledge of the material covered in class and on the homework/lab assignments. The "tentative" dates of the midterm and final examinations are: October 16 (Mid-term Exam) and December 16 (Final Exam). Please make note of these dates, for students who miss the examinations will receive a failing grade unless their absence is authorized. No make up exams will be offered. Please alert your instructor of any conflicts prior to the exam date.

**Class Attendance Policy:** You are expected to attend all class sessions. Exam questions will be based on both assigned readings and materials discussed in class. Attendance will be taken periodically.

**Absence/Tardiness Policy:** If a student needs to reschedule an examination, he or she must have an authorized excuse. Similarly, if a student wishes to receive credit for a late homework, its tardiness must be authorized. If illness is the reason for a missed exam or late homework, please submit written documentation of this illness from the health center or a doctor to the instructor.

**Disability Policy:** If you have a disability for which you may be requesting an accommodation, please contact either your instructor or Ann Smith, Coordinator of Services for Students with Disabilities (Onward Building, 581-3129), as early as possible in the term.

## Course Schedule and Reading Assignments

### Week 1 Course Introduction (September 2 & 4)

- Lecture: Spatial Data, GIS, and Resource Economics and Policy  
Bolstad, Chapter 1  
Ormsby, Chapter 1  
Tufte, E.R. 1983. *The Visual Display of Quantitative Information*. Graphics Press: Cheshire, Connecticut, pp. 1-51 (Chapters 1 and 2).
- Lab: Thinking Spatially. Developing a Spatial Perspective.  
  
Tuttle, J. 2003. "Who Owns Our Coast," *Bangor Daily News*, August 9-10, p. A1, A6-A7.

### Week 2 Data Management (September 9 & 11)

- Lecture: Acquiring, Managing, and Organizing Spatial Data  
Bolstad, Chapters 2 and 8
- Lab: Nuts and Bolts. Database Management and Introduction to ArcGIS  
Ormsby, Chapters 2, 3, and 4

### Week 3 Spatial Data : Features and Visualization (September 16 & 18)

- Lecture: Spatial Data and Data Visualization  
Ormsby, Chapters 5, 6, 7, and 8  
Bolstad, Chapter 9, pp. 230-243
- Lab: Get Spacey. Visualization and Attribute Queries using Arc Map (Policy Application – Elections - Explaining Votes as a Function of Demographic Characteristics; US Census of Housing and Population Data and 2000 Presidential Election Data )

### Week 4 Spatial Data: Projections, Units, and Raster and Vector Data (September 23 & 25)

- Lecture: Properties of Spatial Data  
Bolstad, Chapters 3 and 4  
Ormsby, Chapters 11 and 13
- Lab: Time in the Trenches. Managing Spatial Data: Importing and Exporting Data, Re-projecting Data, Clipping Data, and Joining Tables (Policy Application – Water Quality; USGS Data Resources)  
Ormsby, Chapter 9

## Week 5 Spatial Analysis: Proximity and Neighbors (September 30 & October 2)

- Lecture: Proximity – Distance and Neighborhood Measures  
Ormsby, Chapters 10  
Bolstad, Chapter 10, pp. 268-280
- Lab: Close to you ? Location Queries, Spatial Joins, and Neighborhood Functions (Policy Application - Environmental Justice, Risk, and Superfund Sites; US EPA NPL Site data and US EPA Toxic Release Inventory Data)

Maantay, J. 2002. "Mapping Environmental Injustices: Pitfalls and Potential of Geographic Information Systems in Assessing Environmental Health and Equity," *Environmental Health Perspectives* 110 (suppl 2): 161-171.

Arora, S. and T.N. Cason. 1999. "Do Community Characteristics Influence Environmental Outcomes? Evidence from the Toxics Release Inventory." *Southern Economic Journal* 65(4): 691-716.

## Week 6 Spatial Analysis – Buffers and Overlay (October 7 & 9)

- Lecture : Buffers and Overlay Analysis  
Ormsby, Chapter 12  
Bolstad, Chapter 9, pp. 246-266
- Lab: Relationships in Space: Union, Dissolve, and Intersect. Buffer and Overlay Analysis (Policy Application – Land Use Change - Describing Land Use Patterns and Predicting Change)

Nasser, H.E. and P. Overberg. 2001. "A Comprehensive Look at Sprawl in America," *USA TODAY*(<http://www.usatoday.com/news/sprawl/main.htm>.) Updated 02/22/2001. Refer to Calculation of Sprawl Index.

Irwin, E.G., Bell, K.P. and J. Geoghegan. 2003. "Modeling and Managing Urban Growth at the Rural-Urban Fringe: Evidence from a Model of Residential Land Use Change," *Agricultural and Resource Economics Review* 32(1):83-102.

## Week 7 Midterm Exam (October 16)

## Week 8 Communicating with Maps (October 21 & 23)

- Lecture – Spatial Display of Quantitative and Qualitative Information  
Ormsby, Chapters 18-19
- Lab: A Picture is Worth a 1000 Words. Using Layout to Create High Quality Maps (Policy Applications – Public Health - CDC Data on Cancer Mortality)  
Tufte, E.R. 1983. *The Visual Display of Quantitative Information*. Graphics Press: Cheshire, Connecticut, pp. 107-121 (Chapter 5).

Week 9 Creating Spatial Data – Basic Editing (October 28 & 30)

- Lecture: Starting from Scratch – Basic Editing Tips and Use of GPS Data  
Bolstad, Chapter 5  
Ormsby, Chapter 15
- Lab: Into the Woods. Importing GPS Data into ARCGIS (Policy Application – Mapping a Section of the Orono Land Trust Trail Network)

Week 10 Creating Spatial Data - Address Matching (November 4 and November 6)

- Lecture: Economic Analyses and Geocoding  
Ormsby, Chapter 17
- Lab: Address Matching In Action. (Policy Application – Mapping Cultural Heritage Sites for Piscataquis County, Maine)

Week 11 Policy Applications I (November 11 and November 13)

- Lecture: Environmental Policy Applications of GIS
- Lab: Where the Wild Things Are? Proximity to Wildlife Refuges and Property Values.

Bateman, I.J., Jones, A.P., Lovett, A.A., Lake, I.R., and B.H. Day. “Applying Geographical Information Systems to Environmental and Resource Economics.” *Environmental and Resource Economics* 22: 219-269.

Ando, A., Camm, J., Polasky, S., and A. Solow. 1998. “Species Distributions, Land Values, and Efficient Conservation,” *Science* 279: 2126-2128.

Week 12 Policy Applications II (November 18 and November 20)

- Lecture: Agriculture and Community Economic Development Applications of GIS  
Orfield, M. 1997. *Metropolitcs: A Regional Agenda for Community and Stability*. Washington, DC: Brookings Institution.  
USDA. Applications of GIS technology to Agricultural Policy.  
<http://www.nrcs.usda.gov/technical/land/nrcsdata.html>  
<http://www.ers.usda.gov/Emphases/Rural/>  
<http://www.ers.usda.gov/topics/view.asp?T=103610>
- Lab: Location, Location, Location. Location Decisions of Firms (High-tech, Starbucks, Walmart)

Week 13 Spatial Statistics – An Introduction (November 25)

- 2 Lectures: Basic Spatial Statistics  
Bolstad, Chapter 12.  
Bailey, T.C. and A.C. Gatrell. 1995. *Interactive Spatial Data Analysis*. Harlow, England: Prentice Hall. Chapter 1.  
\*Fotheringham, A.S., Brundson, C., and M. Charlton. 2000. *Quantitative Geography: Perspectives on Spatial Data Analysis*. London: Sage Publications. Subset of Material Drawn from Chapters 5-8.  
\*Haining, R. 1990. *Spatial Data Analysis in the Social and Environmental Sciences*, Cambridge: Cambridge University Press. Chapters 1-2.

Week 14 Spatial Statistics – Patterns, Interpolation, and Processes (December 2 and 4)

- Lecture: Policy Applications of Spatial Statistics  
Bolstad, Chapters 13 and 14.  
\*Fotheringham, A.S., Brundson, C., and M. Charlton. 2000. *Quantitative Geography: Perspectives on Spatial Data Analysis*. London: Sage Publications. Chapter 7.
- Lab: Geostatistics. (Policy Application – Air Pollution Monitoring - Ozone)

Week 15 Spatial Statistics – Spatial Dependence (December 9 & 11)

- 2 Lectures: Econometrics and Spatial Data  
Anselin, L. 2003. "Under the Hood: Issues in the Specification and Interpretation of Spatial Regression Models," *Agricultural Economics* 17 (3), 2002: 247-267.  
\*Fotheringham, A.S., Brundson, C., and M. Charlton. 2000. *Quantitative Geography: Perspectives on Spatial Data Analysis*. London: Sage Publications. Chapter 7.

**Final Examination December 16 8AM**