June 15, 2017

PPOL-G 746 Geographic Information Systems for Public Policy

Michael P Johnson, Jr.

University of Massachusetts Boston
Department of Public Policy and Public Affairs
Public Policy Ph.D Program

PPOL-G 746 Geographic Information Systems for Public Policy

Spring 2017

I. Course Administration

Course Schedule:

Class meetings: Thursday, 3:00 – 5:20 PM, Healey Library Room 3-009E (White Lab)

Professor:
Michael P. Johnson
McCormack Hall, Room 3 – 428A
617-287-6967
michael.johnson@umb.edu
http://www.umb.edu/academics/mgs/faculty/michael_johnson/
Office Hours: TBD and by appointment

Teaching Assistant:
Sandeep Jani
Sandeep.jani001@umb.edu

GIS Lab Director and manager, UMass Boston ArcGIS site license:
Helenmary Hotz
Science Building, Room 3-021
617-287-5289
helenmary.hotz@umb.edu

Session format:

- 3:00 – 4:00 PM: Theory and applications; class discussion
- 4:00 – 4:15 PM: Student case presentations
- 4:15– 4:25 PM: Break
- 4:25 – 5:20 PM: Tutorials and hands-on work

Course Description:

Geographic Information Systems (GIS) are hardware, software, and procedures designed to support the capture, management, manipulation, analysis, modeling and display of spatially referenced data for scientific inquiry and solving complex planning and management problems. GIS applications use both spatial information (maps) and databases to perform analytical studies.

The purpose of this course is to learn principles and applications of GIS to support doctoral-level research and master's-level research and analysis in public policy and related disciplines, such as public management, gerontology and urban and regional planning. This course has a particular focus on spatial data collection and analysis for urbanized regions within the greater Boston area. We will address basic geographic and mapping concepts. These include: world coordinate system and projections, map topology, tiled and layered maps, standard computer map file formats, data processing and data analysis, including Web-enabled GIS. We will also study advanced methods suitable for doctoral research such as exploratory spatial analytic methods, model-building and multi-method & qualitative GIS. Hands-on tutorials using GIS software, and case studies and current scholarly research are integrated into nearly every class meeting. Application areas to be discussed include: economic development, housing, transportation, land use, crime and policing, census and demographic studies and public health.

The goal of this course is to enable students to identify spatial characteristics of diverse application areas, to build maps that integrate diverse data sources, formats and displays, to perform spatial analyses, and to integrate spatial thinking and GIS analysis into their own research topics.

The technical focus of the course will be desktop GIS for descriptive and exploratory analysis using ESRI's ArcGIS 10.3, applied mainly to vector data, with some applications to raster data as well. We will address current topics such as Internet-enabled GIS, Internet-facilitated community GIS and spatial decision support systems as resources and student interest permit.

Lectures will take place in a classroom equipped with computer workstations and will consist of seminar-style discussions combined with hands-on demonstrations. GIS features and methods will be taught using two complementary sources: an introductory-level tutorial with step-by-step exercises suitable for self-teaching as well as classroom instruction, and textbook-based treatments of GIS fundamentals and research-oriented extensions. GIS applications will be presented through textbook-based case studies and journal articles.

There is no specific course prerequisite aside from graduate standing. However, it will be helpful if students are familiar with common office productivity applications such as spreadsheets and relational databases.

Course requirements include: GIS tutorial exercises; three assignments, combining discussion of GIS research and hands-on data analysis, a course project and in-class discussion. If you anticipate substantial overlap between your course project topic and your dissertation research, or other research outside of the class, please discuss this with the instructor before starting work on the course project.

<u>Topics Covered</u>:

- Map design and presentation
- Data collection and integration, including projections
- Geodatabase design and analysis, including links between spatial and non-spatial data
- Map modification and geocoding
- Spatial analysis

- Spatial statistics
- Mixed-methods and qualitative GIS
- Raster GIS
- 3-D GIS
- Online spatial data and GIS-related services
- GIS, big data and data analytics
- Networks, GIS and spatial optimization
- Policy design, analysis, community development and advocacy using GIS
- Real-world GIS applications

Grading Policy:

This course welcomes masters and doctoral students. Doctoral student course requirements include the following: two graded assignments, which will together count 35% towards the final grade; class participation, which will count 20% towards the final grade, and a course project, which will count 45% towards the final grade. The project will consist of the following graded components: short description (10% of total project grade); detailed description (20%); final report (45%), and final presentation (25%).

Masters student course requirements are *identical* to those of doctoral students. However, it is understood that masters students bring a different set of experiences, perspectives and expectations to the course as compared with doctoral students. For example, masters student contributions to the class, in both written and oral form, are more likely to reflect their current employment experiences. They may have less time or inclination to explore scholarly resources beyond the required readings. Therefore, I will evaluate and grade master's student course submissions in comparison to each other masters students, and not in comparison to doctoral students. I will apply norms for masters student grading that reflect the range of quality of submissions and my subjective assessment of the capabilities of the masters students.

The grade allocation is as follows:

Course Component	**Proportion of Final Grade**
Assignments (2)	35%
Course project (short description, detailed description, presentation, paper)	45%
Class participation	20%

Assignments are intended to reinforce material presented during lecture. They consist of exercises drawn from the required texts, and customized exercises using data collected specifically for this class.

The *course project* is intended to integrate spatial data and spatial reasoning into students' research interests. Students will propose, and implement, a research project that includes:

- Publicly-available spatial and non-spatial data
- (If possible) Non-publicly-available spatial data to be collected via field research
- Creation of a geodatabase: linked tables, non-spatial and spatial queries
- Reports that combine maps, tables and graphs
- Hypotheses to be tested and shown to be supported or not
- Public policy analysis, including insights that could not have been derived from conventional (non-spatial) analysis
- GIS extensions, where appropriate: exploratory data analysis, multi-methods, 3-D visualization, spatial decision support, virtual reality, specialized spatial data sources, Internet-enabled participation

Class participation consists of productive, informed verbal contributions during lectures and tutorials and on class discussion boards, and discussions on case studies and/or journal articles related to a particular lecture. During most lectures, pairs of students will lead discussions on case studies and related journal articles.

Course Resources:

There are three required texts for purchase, listed below. You may purchase these texts at the university bookstore or at a commercial seller. All other required texts are available in PDF form on Blackboard. Many other optional texts are available on Blackboard as well. You are welcome to purchase these texts if you feel that they will be of use to you in research or practice.

Required Texts for Purchase:

Gorr, W.L. and K.S. Kurland. 2016. *GIS Tutorial 1: Basic Workbook for ArcGIS 10.3.X*. Redlands, CA: ESRI Press. ISBN: 9781589484566. [Includes data CD and limited-time license for ArcGIS 10.3.X]. Available at UMass Boston bookstore for $79.99 (new - printed); $39.99 (new - digital).

Mantaay, J. and J. Ziegler. 2006. *GIS for the Urban Environment*. Redlands, CA: ESRI Press. ISBN: 9781589480827. [Includes data CD]. Available at UMass Boston bookstore for $60.00 (used - purchase); $31.98 (used - rent).

Mitchell, A. 2009. *The ESRI Guide to GIS Analysis, Volume 2: Spatial Measurements and Statistics*. Redlands, CA: ESRI Press. ISBN: 9781589481169. Available at UMass Boston Bookstore for $34.95 (new - purchase); $26.25 (used - purchase); $26.21 (new - rent); $13.98 (used - rent).

Additional Required Texts [available on Blackboard]:

Allen, D.W. 2010. *GIS Tutorial 2: Spatial Analysis Workbook for ArcGIS 10*. Redlands, CA: ESRI Press [excerpts].

Chang, K.-T. 2012. *Introduction to Geographic Information Systems, Sixth Edition*. New York: McGraw-Hill [excerpts].

Cope, M. and S. Elwood (Eds.) 2009. *Qualitative GIS: A Mixed Methods Approach*. Los Angeles: SAGE Publications [excerpts].

Gorr, W. and K. Kurland. 2012. *Core Concepts of GIS*. Unpublished manuscript [excerpts].

Shellito, B. 2012. *Introduction to Geospatial Technologies*. New York: W.H. Freeman and Company [excerpts]

Thomas, C. and N. Humenic-Sappington. 2009. *GIS for Decision Support and Public Policy Making*. Redlands, CA: ESRI Press [excerpts].

Supplementary Texts [† = available on Blackboard]:

†Ayeni, B. 1997. "The Design of Spatial Decision Support Systems in Urban and Regional Planning", in (H. Timmermans, Ed.) *Decision Support Systems in Urban Planning*. London: E & FN SPON, 3 – 22.

†Barton, J., Plume, J. and B. Parolin. 2005. Public Participation in a Spatial Decision Support System for Public Housing. *Computers, Environment and Urban Systems* **29**: 630 – 652.

†Brewer, C. 2005. *Designing Better Maps*. Redlands, CA: ESRI Press (Appendix B: Color-Blind Combinations).

Bodenhamer, D.J., Corrigan, J. and T.M. Harris (Eds.) 2010. *The Spatial Humanities: GIS and the Future of Humanities Scholarship*. Bloomington, IN: Indiana University Press.

Curry, M.R. 1998. *Digital Places: Living with Geographic Information Technologies*. New York: Routledge

†Daskin, M.S. 1995. *Network and Discrete Location*. New York: John Wiley & Sons, Inc. [excerpts].

†Drezner, Z, and H.W. Hamacher (Eds.) 2001. *Facility Location: Applications and Theory*. Berlin: Springer [excerpts].

†Ellwood, S. 2006. Critical Issues in Participatory GIS: Deconstructions, Reconstructions, and New Research Directions. *Transactions in GIS* **10**(5): 693–708.

†Ellwood, S. 2002. GIS Use in Community Planning: a Multidimensional Analysis of Empowerment. *Environment and Planning A* **34**: 905 – 922.

†Fischer, M.M. and A. Getis (Eds.) 2010. *Handbook of Applied Spatial Analysis: Software Tools, Methods and Applications*. Heidelberg: Springer [excerpts].

†ESRI. 2016a. *Geostatistical Analyst Tutorial*. Redlands, CA: ESRI Press. Web: http://desktop.arcgis.com/en/arcmap/latest/extensions/geostatistical-analyst/introduction-to-the-arcgis-geostatistical-analyst-tutorial.htm. Retrieved January 25, 2017.

†ESRI. 2016b. *Modeling Spatial Relationships*. Redlands, CA: ESRI Press. Web: http://pro.arcgis.com/en/pro-app/tool-reference/spatial-statistics/modeling-spatial-relationships.htm. Retrieved January 25, 2017.

†ESRI. 2014. *Network Analyst Tutorial*. Redlands, CA: ESRI Press. Web: http://resources.arcgis.com/en/help/main/10.1/index.html#//00470000005r000000. Retrieved January 25, 2017.

Gorr, W. and K. Kurland. 2011. *GIS Tutorial for Crime Analysis*. Redlands, CA: ESRI Press.

Greene, R.W. 2001. *Open Access: GIS in e-Government*. Redlands, CA: ESRI Press.

†Hastings, D. and M.L. Miranda. 2011. "Using GIS-Based Models to Protect Children from Lead Exposure." In (M.P. Johnson, Ed.) *Community-Based Operations Research*. New York: Springer, 173 – 187.

Kurland, K. and W. Gorr. 2012. *GIS Tutorial for Health, 4th Edition*. Redlands, CA: ESRI Press.

†Lee, J. and D.W.S. Wong. 2001. *Statistical Analysis with ArcView GIS*. E-book: John Wiley & Sons.

Library of Congress. 2006. *Mapping for Congress: Supporting Public Policy with GIS*. Redlands, CA: ESRI Press.

Lindell Radke, S. 2009. *GIS Tutorial for Homeland Security, 2nd Edition*. Redlands, CA: ESRI Press.

Malczewski, J. 1999. *GIS and Multicriteria Decision Analysis*. New York: John Wiley & Sons, Inc.

†Mitchell, A. 1999. *The ESRI Guide to GIS Analysis, Volume 1: Geographic Patterns & Relationships*. Redlands, CA: ESRI Press [excerpts].

Mitchell, A. 2012. *The ESRI Guide to GIS Analysis, Volume 3: Modeling Suitability, Movement and Interaction*. Redlands, CA: ESRI Press.

†Monmonier, M. 1996. *How to Lie with Maps, 2nd Edition*. Chicago: University of Chicago Press [excerpts].

†Murray, A.T. and T.H. Grubesic. 2011. "Spatial Optimization and Geographic Uncertainty: Implications for Sex Offender Management Strategies." In (M.P. Johnson, Ed.) *Community-Based Operations Research*. New York: Springer, 121 – 142.

†Nedrovic- Budic, Z. and D.R. Godschalk. 1996. Human Factors in Adoption of Geographic Information Systems: A Local Government Case Study. *Public Administration Review* **56**(6): 554 – 567.

†Nyerges, T., Jankowski, P. and C. Drew. 2002. Data-Gathering Strategies for Social-Behavioural Research about Participatory Geographical Information System Use. *International Journal of Geographical Information Science* **16**(1): 1 – 22.

†Sui, D.Z. and M.F. Goodchild. 2003. A Tetradic Analysis of GIS and Society using McLuhan's Law of the Media. The Canadian Geographer / Le Géographe canadien **47**(1): 5 – 17.

Peake, R. 2012. *Mapping Census 2010: The Geography of American Change*. Redlands, CA: ESRI Press.

†Tableau Software. 2017. *Designing Great Visualizations*. Web: https://www.tableau.com/whitepapers/designing-great-visualizations. Retrieved January 25, 2017.

†Uran, O. and R. Janssen. 2003. Why Are Spatial Decision Support Systems Not Used? Some Experiences from the Netherlands. *Computers, Environment and Urban Systems* **27**: 511 – 526.

Verjee, F. 2010. *GIS Tutorial for Humanitarian Assistance*. Redlands, CA: ESRI Press.

†Vieira, V.M., Webster, T.F., Weinberg, J.M. and A. Aschengrau. 2008. Spatial-temporal analysis of breast cancer in upper Cape Cod, Massachusetts. *International Journal of Health Geographics* **7**(46).

Wise, S.M. and M. Craglia (Eds.). 2008. *GIS and Evidence-Based Policy Making*. Boca Raton, FL: CRC Press.

†Winston, W.L. and M. Venkataraman. 2003. Introduction to Mathematical Programming: Operations Research: Volume I, 4th Edition. Pacific Grove, CA: Thomson – Brooks/Cole [excerpts].

†Yao, J., Tawfik, H. and T. Fernando. 2006. "A GIS Based Virtual Urban Simulation Environment", in (V.N. Alexandrov, G.D. van Albada, P.M.A Sloot, and J.J. Dongarra, Eds.), *Computational Science - ICCS 2006: 6th International Conference, Reading, UK, May 28-31, 2006, Proceedings, Part III*. Berlin: Springer-Verlag, pp. 60 – 68.

†Zwack, L.M., Paciorek, C.J., Spengler, J.D. and J.I. Levy. 2011. Modeling Spatial Patterns of Traffic-Related Air Pollutants in Complex Urban Terrain. *Environmental Health Perspectives* **119**(6): 852 – 859.

†Excel spreadsheet with sources for Boston-area spatial data and population tabulations (`GIS Datasets for class 02.xls`)

†Excel spreadsheet with Web-based GIS resources (`WebGIS for Class 04 rev 170125.xls`)

Lab Resources:

All lectures will take place in a general-purpose computer lab managed by Healey Library, third floor, room 009E ("White Lab"). This lab, which is reserved for other course besides this one, is available at limited times outside of the class lecture. However, another lab, located in Healey Library, upper level, room 015 ("Red Lab") is available for general student use whenever Healey Library is open (visit https://www.umb.edu/library/about/hours to verify Healey Library hours).

The Department of Public Policy and Public Affairs has a computer lab in McCormack Hall, third floor, room 414, where ArcGIS is installed on two workstations. While this lab is intended to serve Public Policy and Public Affairs students, it is available on weekends to non-department students taking Public Policy and Public Affairs courses. Access to this lab requires a key code available from the professor. Students may login to workstations using their UMass Boston email usernames,

and their UMass Boston email passwords. Students from other departments who use university-owned workstations may request Helenmary Hotz to install licenses of ArcGIS on their computers.

Web Resources:

This course has a Blackboard Learn course management website containing lectures, readings, assignments, Internet resources and a discussion board for questions of general interest and responses. The instructor will post general questions received by email, and responses to these questions to the Blackboard discussion board.

To access the Blackboard course page:

- Go to https://umb.umassonline.net/;
- Enter your UMass Boston email username and password;
- Navigate to the "PPOL-G 746 P 1 01 GIS for Public Policy Spring 2017" course page in your "My Courses" list.

Accommodations:

Section 504 of the Americans with Disabilities Act of 1990 offers guidelines for curriculum modifications and adaptations for students with documented disabilities. If applicable, students may obtain adaptation recommendations from the Ross Center for Disability Services, M-1-401, 617-287-7430; https://www.umb.edu/academics/vpass/disability. The student must present these recommendations and discuss them with each professor within a reasonable period, preferably by the end of Drop/Add period.

Student Conduct:

Students are required to adhere to the University of Massachusetts Boston Code of Conduct. The Code is available online at: https://www.umb.edu/life_on_campus/policies/community/code. Section XI of the Code, "Academic Honesty", states that:

"It is the expressed policy of the University that every aspect of academic life not only formal coursework situations, but all relationships and interactions connected to the educational process shall be conducted in an absolutely and uncompromisingly honest manner. The University presupposes that any submission of work for academic credit indicates that the work is the student's own and is in compliance with University policies. In cases where academic dishonesty is discovered after completion of a course or degree program, sanctions may be imposed retroactively, up to and including revocation of the degree. Any student who reasonably believes another student has committed an act of academic dishonesty should inform the course instructor of the alleged violation."

Section XII of the Code, "Academic Honesty Violations", states, in part:

"The University defines violations to include, but not be limited to, the following:

1. Submitting as one's own an author's published or unpublished work (e.g. material from a journal, Internet site, newspaper, encyclopedia), in whole, in part, or in paraphrase, without fully and properly crediting the author.
2. Submitting as one's own work or materials obtained from another student, individual, or agency without full and proper attribution.
3. Submitting as one's own work material that has been produced through unacknowledged or unauthorized collaboration with others.
4. Submitting substantially the same work to more than one course without prior approval from all instructors involved: i.e., dual or multiple submission."

These policies are spelled out in full in the Code of Student Conduct.

II. Lecture Schedule

Note: This schedule is subject to revision in case of campus closings, for example due to extreme winter weather. When a lecture must be cancelled due to campus closure, the instructor may choose to re-schedule the lecture according to campus policies and procedures, or to post the lecture material on-line, or both. Every effort will be made to avoid additional disruption to student schedules. Schedule changes may result in changes to due dates for assignments and projects.

Date	**Topic**	**Class Materials**
January 26	Lecture #1: Introduction to GIS for Public Policy	*Reading*: Gorr and Kurland, *Core Concepts of GIS* , Chapter 1, "Introducing GIS" Mantaay and Ziegler, Chapter 1, "Basics of Mapping and GIS" *Case Study:* Thomas and Humenik-Sappington, "Using GIS in tribal negotiations", pp. 41 – 42 *Tutorial:* Gorr and Kurland, *GIS Tutorial 1*, Chapter 1, "Introduction" *Assignment*: Assignment #1 due March 2
February 2	Lecture #2: Map Design	*Reading*: Gorr and Kurland, *Core Concepts of GIS*, Chapter 4, "Cartographic Design" Mantaay and Ziegler: • Chapter 2, "Spatial Data and Basic Mapping Concepts", pp. 25 – 38 • Chapter 3, "Thematic Mapping" *Case Study:* Thomas and Humenik-Sappington, "Assessing environmental vulnerability in Boston Harbor", pp. 31 – 40 *Tutorial*: Gorr and Kurland, *GIS Tutorial 1*, Chapter 2, "Map Design"
February 9	No class – university closed due to weather	

Date	Topic	Class Materials
February 16	Lecture #3: GIS Outputs	*Reading and Web Resources*: Mantaay and Ziegler: • Chapter 4, "Data Classification Methods and Data Exploration" • Chapter 5, "Data Visualization and Map Design" ArcGIS Online: https://www.arcgis.com/home/index.html. *Case Study:* Mantaay and Ziegler, "Community-Based Planning", pp. 415 – 423 *Tutorial*: Gorr and Kurland, *GIS Tutorial 1*, Chapter 3, "GIS Outputs" *Assignment*: Preliminary (one-page) description of course project due March 9
February 23	Lecture #4: Database Analysis in GIS	*Reading*: Mantaay and Ziegler, Chapter 8, "Attribute Data and Relational Database Management Systems" *Case Study:* Mantaay and Ziegler, "Urban Environmental Planning", pp. 357 – 364. *Tutorial*: Gorr and Kurland, *GIS Tutorial 1*, Chapter 4, "File Geodatabases"
March 2	Lecture #5: Spatial and Attribute Data and GIS Data Sources	*Reading and Web Resources*: Gorr and Kurland, *Core Concepts of GIS*: • Chapter 3, "Map Coordinates and Projections" • Chapter 5, "Geospatial Data Infrastructure" Mantaay and Ziegler: • Chapter 2, "Spatial Data and Basic Mapping Concepts", pp. 39 - 53 • Chapter 6, "Sources of Urban Data" `WebGIS for Class 04 rev 170125.xls` (Blackboard Learn)

Date	Topic	Class Materials
		`GIS Datasets for class 02.xls` (Blackboard Learn) *Case Study:* Mantaay and Ziegler, "Delivering Health-Care Services to an Urban Population", pp. 341 – 347. *Tutorial:* Gorr and Kurland, *GIS Tutorial 1*, Chapter 5, "Spatial Data" *Assignment*: Assignment #1 collected Assignment #2 due April 13
March 9	Lecture #6: Data Generation: Digitizing, Geocoding and Sensing	*Reading*: Chang: • Chapter 5, "GIS Data Acquisition", pp. 96 – 106 • Chapter 16, "Geocoding and Dynamic Segmentation", pp. 344 – 350 Mantaay and Ziegler, Chapter 7, "Mapping Databases" *Case Study:* Mantaay and Ziegler: • "Infrastructure Mapping for Planning and Maintenance", pp. 377 – 381 • "Archaeology and Historic Preservation with GIS", pp. 383 – 391 *Tutorial*: Gorr and Kurland, *GIS Tutorial 1*, Chapter 8, "Geocoding" *Assignment*: Preliminary course project description collected
March 16	No class – UMass Boston Spring Break	

Date	Topic	Class Materials
March 23	Lecture #7: Spatial Data Processing and Modeling Introduction	*Reading*: Chang: • Chapter 11, "Vector Data Analysis", pp. 237 – 241 • Chapter 18, "GIS Models and Modeling", pp. 389 – 392 Mantaay and Ziegler, Chapter 9, "Methods of Spatial Data Analysis", pp. 209 – 218 *Case Study:* Mantaay and Ziegler, "Health and Environmental Justice", pp. 393 - 407 *Tutorial*: Gorr and Kurland, *GIS Tutorial 1*, Chapter 6 "Geoprocessing" *Assignment*: Graded Assignment #1 returned Graded preliminary course project description returned Detailed (2 – 3 page) project description due April 6
March 30	Lecture #8: Vector Spatial Analysis and Advanced Modeling	*Reading*: Chang: • Chapter 11, "Vector Data Analysis", pp. 222 – 231 • Chapter 18, "GIS Models and Modeling", pp. 392 – 399 Mantaay and Ziegler, Chapter 9, "Methods of Spatial Data Analysis", pp. 219 – 239 *Case Study:* Murray and Grubesic, "Spatial Optimization and Geographic Uncertainty: Implications for Sex Offender Management Strategies" (2011) *Tutorial:* Gorr and Kurland, *GIS Tutorial 1*, Chapter 9, "Spatial Analysis"
April 6	Lecture #9: Networks and GIS	*Reading*: Required: Chang, Chapter 17, "Least-Cost Path Analysis and Network

Date	Topic	Class Materials
		Analysis" Mitchell (1999), Chapter 6, "Finding What's Nearby" Marianov, V. and D. Serra, "Location Problems in the Public Sector", in Drezner and Hamacher (2001) Optional: Daskin (1995), Chapter 8, "Extensions of Location Problems" Winston and Venkataraman (2003), Chapter 9, "Integer Programing", p. 530 – 539. *Case Study:* Thomas and Humenik-Sappington, "A Web-based GIS tool for railroad hazmat routing", pp. 171 – 179 *Tutorial*: Gorr and Kurland, *GIS Tutorial 1*, Chapter 12, "ArcGIS Network Analyst for Desktop" *Assignment*: Detailed project description collected
April 13	Lecture #10: Qualitative GIS, Community GIS, GIS for Policy Advocacy	*Reading*: Cope and Elwood: • Chapter 1, "Introduction: Qualitative GIS" • Chapter 2, "Non-quantitative GIS" • Chapter 4, "Multiple Representations, Significations and Epistemologies in Community-Based GIS" Mantaay and Ziegler: • Chapter 10, "GIS Project Development and Institutional Issues" • Chapter 11, "Ethical Issues in GIS and Urban Planning" *Case Study:* Mantaay and Ziegler: • "Nonprofit Organization GIS for Strategic Planning and Public Outreach", pp. 323 – 333 • "Advocacy Planning and Public Information", pp. 425 – 430

Date	Topic	Class Materials
		Assignment: Assignment #2 collected Graded detailed project description returned Final project due May 16 (presentation on May 11)
April 20	Lecture #11: Advanced Vector GIS Analysis	*Reading*: Chang, Chapter 11, "Vector Data Analysis", pp. 232- 237 Mitchell (2009): • Chapter 1, "Introducing spatial measurements and statistics", pp. 1 – 12 • Chapter 2, "Measuring geographic distributions", pp. 21 – 61 • Chapter 3, "Identifying patterns", pp. 71 – 134 • Chapter 4, "Identifying clusters", pp. 148 – 181 *Case Study:* Mantaay and Ziegler, "Crime Pattern Analysis", pp. 409 – 413 *Tutorial*: Allen, Chapter 8, "Analyzing Patterns" • Tutorial 8-1, "Using average nearest neighbor" • Tutorial 8-2, "Identifying the clustering of values" • Tutorial 8-4, "Measuring spatial autocorrelation" Allen, Chapter 9, "Identifying Clusters" • Tutorial 9-1, "Performing cluster and outlier analysis" • Tutorial 9-2, Performing hot-spot analysis" *Assignment*: Graded Assignment #2 returned
April 27	Lecture #12: Three-Dimensional GIS and Web GIS	*Reading and Web Resources*: Mantaay and Ziegler, Chapter 12, "Other Geotechnologies and Recent Developments in GIS" Shellito, Chapter 13, "Digital Landscaping"; Chapter 14, "See the World in 3D"; Chapter 15, "What's Next for

Date	Topic	Class Materials
		Geospatial Technology?" Boston Research Map: http://worldmap.harvard.edu/boston/ *Case Study*: Mantaay and Ziegler, "Emergency Management and Disaster Response", pp. 367 – 375 *Tutorial*: Gorr and Kurland, *Tutorial 1*, Chapter 10, "ArcGIS 3D Analyst for Desktop"
May 4	Lecture #13: Raster GIS Analysis	*Reading*: Chang, Chapter 12, "Raster Data Analysis" *Case Study:* Mantaay and Ziegler, "Natural Habitat and Open Space Assessment", pp. 349 – 364 *Tutorial*: Gorr and Kurland, *Tutorial 1*, Chapter 11, "ArcGIS Spatial Analyst for Desktop"
May 11	Final project presentations	
May 13	Graded final project presentations returned	
May 16	Final project papers collected, 5 PM	
May 19	Graded final project papers returned; final grades posted	