Geographic Systems and Analysis
Fall 2016 Syllabus

New York University
Robert F. Wagner Graduate School of Public Service

Instructor
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Office hours by appointment

Schedule
September 6th – December 6th, 2016
4:55pm-6:35pm & 8:35pm-9:35pm
194 Mercer, Room 304

Course Description
Understanding geographic relationships between people, land use, and resources is fundamental to planning. Urban planners routinely use spatial analysis to inform decision-making. This course will introduce students to Geographic Information Systems (GIS), a tool to analyze and visualize spatial data. The course will emphasize the core functions of GIS: map making, data management, and spatial analysis. Students will learn cartographic best practices, how to find and create spatial data, spatial analysis methodology, and how to approach problem solving from a geographic perspective. Throughout the course, students will build a portfolio of professional quality maps and data visualizations.

Objectives
Students will gain the following skills and abilities:

• An understanding of what GIS is and how GIS is used in planning and other fields
• Fluency in the ESRI ArcGIS interface (the most commonly used GIS software package)
• An understanding of where to find existing GIS data and how to create custom GIS data
• Ability to make professional quality maps
• Expertise in working with and visualizing geographic data
• Ability to solve a “spatial question” using GIS

Course Structure
Prerequisite
There is no prerequisite for this class, but this is a data heavy class and students should be prepared to work extensively with data in various formats. Competency in Microsoft Excel is helpful.

Class Format
Most classes will include a lecture introducing a spatial analysis/GIS topic followed by a hands-on exercise (see class schedule). Materials for the lab exercises will be posted on the NYU Classes course site in advance of each class. Any remaining class time will be used to work on graded assignments. There is a lab session from 8:35pm to 9:35pm on Tuesdays. Students are required to attend 8 of the active lab sessions (open labs are optional).
**Academic Integrity**
Consulting with classmates, peers, online GIS resources, and NYU Data Services is encouraged. However, all graded assignments must be individually produced. It is perfectly acceptable for a classmate to help troubleshoot a difficult task but not acceptable to turn in an assignment using output generated by a classmate (such as a shapefile). Students are expected to abide by Wagner’s academic code.

**Graded Assignments & Lab Attendance**
Graded assignments are an opportunity to build a portfolio of professional quality GIS work. Late work will NOT be accepted. More detail about the assignments and grading will be discussed in class.

Each assignment is a stand-alone product and specific analyses cannot be resubmitted for multiple assignments. Focusing on a single topic/theme and using the same core datasets for all the assignments is encouraged!

*Note: Though lab and text exercises are not graded, the skills covered are necessary to complete the graded assignments. Students are responsible for mastering all assigned material.*

1. **Map Portfolio – 25% of grade**
   *Due October 4th, 2016 @ 4:55pm*
Create a series of maps that tell a story about a particular neighborhood or place. The graded deliverable is a package of 4 maps.

The Map Portfolio must:

- Adhere to cartographic best practices, e.g. proper map projection and include a legend, scale, north arrow, insets, and/or other map elements as appropriate
- Maps must be titled and annotated so they can be read as a standalone product
- At least 3 of the maps must be thematic AND make use of table joins

2. **Spatial Analysis Memo – 25% of grade**
   *Due November 1, 2016 @ 4:55pm*
Design and execute an analysis in ArcGIS that addresses a ‘spatial question’. The graded deliverable is a 2-3 page memo detailing the research question, data, analysis methodology, and results. The spatial analysis design should be multistep (include at least 2 geoprocessing tools that create new attribute information).

The memo will include:

- A statement of the research question
- Description of the methodology written for a non-technical audience
- Results (tables and maps, as appropriate)
- An appendix with a flow chart of the tools used to perform the analysis

3. **Research Memo and Presentation – 40% of grade**
   *Proposal due November 8, 2016; in class presentation due December 6, 2016 (submit by 3pm); Research Memo December 9th by midnight.*

Develop a geographically focused research question or topic and submit a proposal by November 8th. The graded deliverable is a research memo, including technical methodology, and class
presentation. The research memo must include a minimum of 5 maps and utilize at least 3 geoprocessing tools. The research presentation can be oriented around a place or around an issue.

4. Lab and Text Assignments –10% of grade
There are 11 active lab sessions (the last two are optional open labs to work on your final research projects). Students must attend 8 of the 11 active lab sessions. Students are responsible for all assigned lab and text materials even if a) students do not attend the lab in person and b) students do not finish the materials within the schedule lab time.

Course Materials

Software
Students wishing to install GIS software on their personal computers can receive a free educational license of ESRI ArcGIS 10.3 from NYU Data Services. Fill out this form to request a free copy: http://guides.nyu.edu/appointment.

Note: ESRI software only runs on Windows operating systems. Many NYU lab computers are equipped with ArcGIS. If you cannot install ArcGIS on your personal computer, you must plan to use NYU lab computers to complete the assignments and labs outside of class time.

Data Storage
Recommended: Bring an external drive or USB flash drive to class (at least 16GB)

Text
*Getting to Know ArcGIS for Desktop*, 3rd edition, by Michael Law and Amy Collins

Optional:
*Mapping It Out*, by Mark Monmonier (great cartography resource)
## Tentative Class Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture Topic</th>
<th>Class Activity</th>
<th>Lab and Text Assignment(s)</th>
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</table>
| 9/6  | Intro to GIS  | Explore ArcGIS I | Explore ArcGIS II  
- What is GIS?  
- Spatial data  
Text chapters 1-4 |
| 9/13 | Map Making I  | Reference Maps  | Map Projection  
- Cartography 101  
- Map Projection  
Text chapter 6 |
| 9/20 | Map Making II | Thematic Maps  | Data Management  
- Table Joins  
- Definition queries  
- Working with attribute tables  
Text chapters 9, 10, 11, 15, 16(a and b) |
| 9/27 | Map Making III| Open Lab  | Text chapters 7, 8  
- Symbolizing geographic data |
| 10/4 | Geoprocessing I | Overlay Analysis | Text chapters 16c, 18 (a,b,c)  
- Spatial selection  
MAP PORTFOLIO DUE @ 5PM |
| 10/11| Geoprocessing II | Proximity Analysis | Text chapters 17, 19 (a,b,c)  
- Measuring distance and other spatial relationships |
| 10/18| Geoprocessing III | | Text chapter 13  
- Multistep analysis  
- Accuracy and precision |
| 10/25| Geocoding | Geocoding | Text chapter 14 |
| 11/1 | Site Selection | Group activity | Text chapter 18d  
SPATIAL ANALYSIS  
MEMO DUE @ 5PM |
| 11/8 | GIS & Urban Planning | Digitizing | KML Conversions  
RESEARCH MEMO PROPOSAL DUE  
Text chapters 12, 13 |
| 11/15| Raster Data | Interpolation, raster analysis | Text chapters 20, 7d  
- Map Algebra  
- Interpolation |
| 11/22| Spatial Stats | Geographic distribution tools | Open Lab (optional)  
- Geographic distribution  
- Cluster analysis |
| 11/29| Course Wrap Up + Final Presentations | Open Lab | Open Lab (optional)  
CLASS PRESENTATION  
DUE @ 3PM |
| 12/6| Final Presentations | | No Lab  
CLASS PRESENTATION  
DUE @ 3PM |
| Friday 12/9| Research Memo Due (NO CLASS) | | |