Geographic Systems and Analysis
Fall 2015 Syllabus

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

Instructor
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Office hours: By appointment

Schedule
Mondays 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 students should be prepared to work extensively with data in various formats, including GIS shapefiles, excel spreadsheets, .zip files, text files, and more. Basic 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 lab 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. Tuesday classes include an extended lab time.
Academic Integrity
Consulting with classmates, peers, online GIS resources, and NYU Data Services is encouraged. However, all graded assignments must be individually produced. For example, it is perfectly acceptable for a classmate to help troubleshoot a difficult task. It is 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
The 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.

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

1. Map Portfolio – 25% of grade
   Due October 13, 2015
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
   ● Include a legend, scale, north arrow, insets, and/or other map elements as appropriate
   ● At least 3 of the maps must be thematic
   ● Maps must be titled and annotated so they can be read as a standalone product

For example, a Map Portfolio featuring Manhattan Community District 02 might include:
   ● Reference map of NYC Community Districts highlighting MN CD 02
   ● Choropleth map of NYC Community Districts symbolizing median household income
   ● Block-level reference map of MN CD 02 showing the locations of schools and fire stations
   ● Lot-level choropleth map of MN CD 02 symbolizing land use type
   ● Census tract-level map of MN CD02 showing population density

2. Spatial Analysis Memo – 25% of grade
   Due November 9, 2015
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). 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 visualization (e.g. flow chart) of the ArcGIS geoprocesses used to perform the analysis

For example, a spatial analysis might address questions such as:
● How many New Jersey residents live in FEMA flood zones?
● How much allowable FAR is unused for each NYC Community District?
● What share of NYC residents live within a ½ mile of a subway stop?

3. Research Report – 50% of grade

Proposal due November 16, 2015; Report and presentation due December 14, 2015

Develop a geographically focused research question or topic and submit a proposal by November 16. The graded deliverable is a report and presentation. The report must include a minimum of 5 maps and utilize at least 3 geoprocessing tools.

The research report can be oriented around a place or around an issue. For example,

● **Place-based research report example:** An in-depth look at Queens. The report will include maps showing demographic characteristics of neighborhoods within Queens, and borough level maps comparing Queens to NYC and NY State. Geoprocessing tools will estimate the percent of residents living near a park and the square footage of commercial buildings in flood zones.

● **Issue-based research report example:** An analysis of food access in the US. The report will feature maps of different food access indicators nationwide and at local levels. The report will explore how a spatial indicator such as 'distance to a grocery store' varies between rural and urban areas. Geoprocessing tools will estimate the number of people living in food deserts nationally and in select cities.

Course Materials

**Software**

Students wishing to install GIS software on their personal computers can receive a free educational license of ESRI ArcGIS 10.2 from NYU Data Services. Note: ESRI software only runs on Windows operating systems. Many NYU lab computers are equipped with ArcGIS.

**Data Storage**

Students should bring a USB flash drive to class (at least 16GB).

**Reading**

*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
Subject to change. The schedule front loads essential topics and class time will be prioritized accordingly. Assigned reading and exercises are to be completed by the following class and refer to *Getting to Know ArcGIS*.

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture</th>
<th>Class activity</th>
<th>Lab</th>
<th>Assignments &amp; Text Exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/14/2015</td>
<td>Intro to GIS</td>
<td>Explore GIS I</td>
<td>Explore GIS II</td>
<td>Chapters 1-4</td>
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<tr>
<td>9/21/2015</td>
<td>Map Making I</td>
<td>Reference maps</td>
<td>Data management best practices</td>
<td>Chapter 6,9,10</td>
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<tr>
<td>9/28/2015</td>
<td>Map Making II</td>
<td>Thematic maps</td>
<td>Map projection best practices</td>
<td>Chapter 7, 8, 11, 15, 16a,b</td>
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<tr>
<td>10/5/2015</td>
<td>Map Making III</td>
<td>Open lab</td>
<td>Open lab</td>
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<td>10/13/2015</td>
<td>Geoprocessing I</td>
<td>Spatial joins I</td>
<td>Spatial joins II</td>
<td>Chapter 16c, 18a,b,c Map Portfolio Due</td>
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<td>10/19/2015</td>
<td>Geoprocessing II</td>
<td>Proximity analysis I</td>
<td>Proximity analysis II</td>
<td>Chapter 17, 19a,b,c</td>
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<tr>
<td>10/26/2015</td>
<td>Geoprocessing III</td>
<td>TBD Geoprocessing</td>
<td>Feature editing</td>
<td>Chapters 12 &amp; 13, 18d</td>
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<td>11/2/2015</td>
<td>Accuracy &amp; Precision; Geocoding</td>
<td>Geocoding</td>
<td>Open lab</td>
<td>Chapter 14</td>
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<td>11/9/2015</td>
<td>Group geoprocessing activity</td>
<td>Group activity</td>
<td>Google KML exporting</td>
<td>Spatial Analysis Memo Due</td>
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<td>11/16/2015</td>
<td>Raster Data</td>
<td>Interpolation</td>
<td>Raster Data: Site selection</td>
<td>Research Report Proposal Due Chapter 20</td>
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<td>11/23/2015</td>
<td>Spatial Statistics</td>
<td>Geographic Distribution Tools</td>
<td>Open lab</td>
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<td>11/30/2015</td>
<td>GIS &amp; Urban Planning</td>
<td>Open lab</td>
<td>Open lab</td>
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<td>12/7/2015</td>
<td>Course Wrap Up + Final Presentations</td>
<td>Open lab</td>
<td>Open lab</td>
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<td>12/14/2015</td>
<td>Final Presentations</td>
<td>No lab</td>
<td>Research Report Due</td>
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