PP224M/UPM206A: Introduction to Geographic Information Systems
Thursday 2pm - 4:50pm - SPA 1015A
Spring 2015

Instructors:
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Office Hours:
Norman: Wednesday (in 3320G) 3:30pm - 5pm
Herbie: Thursday (in 3320F) 11:30am - 1pm

COURSE OVERVIEW AND PURPOSE

This course is designed to familiarize students with the use of geographic data and software in public policy, urban planning and related practice. Students will learn how to use Geographic Information Systems (GIS) to inform practice, advocacy, and policy work. The course focuses on the use of ESRI's ArcGIS.

EXPECTATIONS

Professional practice requires the ability to formulate critical questions about one's experiences and reading; to recognize insufficient information and identify the information needed to solve a problem; to make observations of behavior and events; to process and analyze data in order to make effective decisions, plan a course of action; and to evaluate that action. It is expected that students will employ these skills during this course.

- **Regular attendance.** You are expected to attend every class on time unless discussed in advance with instructor.
- **Completion of tutorials.** Come to class prepared having completed the tutorials and be ready to apply those skills to the current week's lab.
- **Completion of assignments.** Assignments are due at the beginning of class on the day noted in the syllabus.
- **Class participation.** Be present and attentive during class. Ask questions. Help others around you. Please be respectful of your classmates and don't use your phone during class. Additionally, don't use the computers to check your email or do outside work. Any time the instructors or your classmates are speaking, we expect that you will not be using the computer at all.
OBJECTIVES

At the conclusion of this course, each student will:

1. Understand principles and operation of geographic information systems, focusing in particular on ArcGIS;
2. Be able to create and interpret maps, and create effective map designs and layouts;
3. Understand how spatial analysis relates to his or her broader interests in policy or planning;
4. Have developed individual experience in the use of GIS in public policy problems through execution of a final project, and presenting it both orally and written form; and
5. Use spatial data and evidence to provide effective recommendations for changing policy and practice.

COURSE STRUCTURE

Class will be held in the computer lab and will consist of a mixture of lectures on the principles of GIS and spatial data, demonstrations of GIS processes and in-class lab exercises. The course has been designed to marry common practical problems faced by planning and policy practitioners with theories, models and best practices of GIS mapping.

REQUIRED TEXT

GRADING

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Tutorial/Homework Assignments</td>
<td>15%</td>
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<td>Lab Assignments</td>
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<tr>
<td>Midterm Project/Presentation</td>
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<td>Final Project Report</td>
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GRADING POLICY

Assignments are due at the beginning of class. Students are required to turn in all assignments on time as noted in the syllabus. No late assignments will be accepted.

PLAGIARISM POLICY

Plagiarism of any form is a violation of UCLA Student Conduct Code Section 102.01—Academic Dishonesty. Plagiarism includes, but is not limited to, the use of another’s words or ideas as if they were one’s own, including but not limited to representing, either with the intent to deceive or by the omission of the true source, part of or an entire work produced by someone other than the student, obtained by purchase or otherwise, as the student’s original work or representing the identifiable but altered ideas, data, or writing of another person as if those ideas, data, or writing were the student’s original work. Instructors are required to report plagiarism to the Dean of Students Office.

COURSE ASSIGNMENTS

All assignments must be turned in through CCLE. Assignments assigned during the current week will be due the following week unless noted otherwise. For example, the assignments listed for Week 1 will be due before the beginning of the Thursday class of Week 2.

1. Lab Assignments
   Each week we will work through an assignment during class, which focuses on specific aspects of GIS data analysis, manipulation and presentation. Some assignments can be completed during the class time while others will require some outside time. Each lab assignment has a set of questions that you should complete along with the map itself. These questions are designed to help you interpret the map and understand how the technical skills you are learning apply to practice. Each lab assignment must be turned in as noted on the assignment listing. It’s important to stay on top of these lab...
assignments because there will be a new one each class session and late assignments will not be accepted.

2. Tutorial/Homework Assignments
GIS can only be learned by doing. For that reason, it is essential that students have significant practice for each of the concepts introduced and taught. To facilitate this, the GIS workbook has a series of tutorials, with assignments at the end of each chapter. It is highly recommended that students complete these tutorials before class. The homework assignments are listed for each week and due the following week. In some cases, you may be able to complete the homework assignment without doing the tutorial steps, but we do advise that you work through the tutorial steps to continue familiarize yourself with the software. Most of the assignments specify an output (save your map as a .jpg) but in the case that they don’t, export your map as a .pdf, .jpg or .png with the materials listed in the requirements section. You will also need to answer the questions that accompany the assignments and include it with the map upload.

3. Midterm Project Proposal
Each student needs to complete the midterm proposal form indicating their topic, the issue to be analyzed, the scale of the analysis, data needs and proposed goals.

4. Midterm Project/Presentation
This midterm project is the beginnings of the final project. This should analyze a policy or disparity issue and begin the process of mapping the issue. This midterm project requires at least 4 maps and the full description is listed at the end.

5. Final Project Presentation
The goal is to be creative and keep the class entertained! You should tell the class about project, the findings, the challenges you faced, and the lessons you learned, but you can do that in any way you desire. The presentation should be no more than 10 slides. Plan for approximately 10 minutes for your presentation.

6. Final Project Report
Each person will develop their own final project. The full description and requirements are listed at the end of this document. Two important things to keep in mind:

1. Choose a social welfare, policy, planning or public health question or problem for which you will use maps to analyze an issue. The project proposal and midterm assignment will help to inform this project. The aim of the projects are to explore a real-world phenomenon, ask a question, and through the use of GIS, work to answer that question.

2. Your project should motivate action. Think of whom the audience is and use your analysis to speak to them. Provide a series of recommendations that people in the field can use to improve your issue of interest.
## COURSE OUTLINE

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Class Topics</th>
<th>Reading</th>
<th>Homework &amp; Lab Assignments</th>
<th>Assignment Due Date</th>
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</table>
| 1    | 4/2  | • Introduction to ArcGIS  
• Adding data and geography layers  
• Lab 1: Juvenile Probation and Re-entry | Chapter 1 | • A1-1  
• Lab 1 | 4/9     |
| 2    | 4/9  | • Using Administrative Data  
• Creating inset maps  
• Projections  
• Introduce midterm project  
• Lab 2: Norwood school analysis | Chapter 2 | • A2-2  
• Lab 2 | 4/16    |
| 3    | 4/16 | • Introduction to American Fact Finder  
• Joining census data to shapefiles  
• Data sources - Lewis Center  
• Lab 3: Marijuana dispensaries in Sacramento | Tutorial 5-6 to 5-11 | • AS-1  
• Lab 3  
• Midterm project proposal (Wed 4/22) | 4/23    |
| 4    | 4/23 | • Geocoding  
• Creating Buffers  
• Midterm proposal comments  
• Lab 4: Inglewood liquor stores | Chapter 8 | • A8-2  
• Lab 4 | 4/30    |
| 5    | 4/30 | • Creating a model  
• Extracting information from a buffer  
• Lab 5: Sacramento drug arrests | Chapter 6 | • A6-1  
• Lab 5  
• Midterm project presentations (Thurs 5/7) | 5/14    |
| 6    | 5/7  | • Midterm project presentations | No reading | • A6-2 | 5/14    |
| 7    | 5/14 | • Midterm review/Next steps  
• Introduction to raster data  
• Lab 6: Spatial analysis | Chapter 9 | • A9-1  
• Lab 6 | 5/21    |
| 8    | 5/21 | • Transportation data  
• Lab 7: Network analyst | Chapter 11 | • A13-2  
• Lab 7 | 5/28    |
| 9    | 5/28 | • Final project checklist  
• Lab 8: Working with crime data and time series analysis | Tutorial 3-7 | • Lab 8 | 6/4     |
| 10   | 6/4  | • Review quarter  
• Topics by request  
• Work on final project | | • Final project presentations (Thurs 6/11)  
• Final report (Fri 6/12) | 6/11    |
| Finals | 6/11 | • Final project presentations | | | |
PROJECT DESCRIPTIONS

The purpose of the midterm and final is for you to take the skills learned in class and in the tutorials and apply them to a specific topic using your own data. This allows you to analyze a planning, policy, disparity or social welfare topic of your choice. This topic must have a spatial component that GIS can help you explore, display and analyze. The midterm requires you to explore and describe the project area and pertinent demographics, while the final entails a deeper analysis of the issue. The midterm requires you to acquire geographic and attribute data, assemble the data using ArcMap and produce several layouts that displays your topic. You must work independently, but are welcome to share datasets with students with similar topics.

Midterm Project

Data Acquisition
First, select an issue and/or geographic area that you are interested in examining spatially. Consider what geographic scale is appropriate for addressing the questions that interest you. For instance, a neighborhood analysis could use block group level data. An analysis of an entire region of Los Angeles County could use tract level data.

Next, you will need to acquire geographic and attribute data which will help you investigate the issues and geographic area you are interested in. You will need to review the layout requirements below and ensure that you acquire data that allows you to meet them. You may choose to only use census-based data for the midterm, although you may also use other data sources (you will be required to use “original” data for the final). You can acquire both geographic and attribute data from ESRI. In addition, you may acquire this data from other sources, including Internet sources listed on links from Week 2.

Data Assembly
After acquiring the data for your midterm, you should assemble it into an ArcMap project. Review the layout requirements below for creating the required layouts. Here are a few helpful hints as you proceed:

- File Size. Size down large geographic and attribute files to the size you need. Try not to work with files that are extremely large.
- File Management. Use naming conventions for your files and directories that are systematic and logical to you.
- Backup your Project. Create backup copies of your work, either on your computer and/or a flash drive.
- Create Separate Map Files for Each of Your Layouts. This will help to keep you organized.
Midterm Project Requirements
A Powerpoint presentation that briefly introduces the planning or policy issue that you have chosen and includes between four and eight different layouts using at least five of the skills described below. Each layout should be somewhat distinct and should display your data in a clear and uncluttered way. In addition, each layout should include necessary titles, your name, a scale bar, a north arrow and a legend. You are required to meet at least five of the following requirements (5 requirements altogether, not 5 requirements per layout; one layout can use more than one requirement):

Inset map. Small map situating the main mapping frame within a larger area.

Point or line graduated symbol. Displaying of points or lines using symbols that increase proportionally or change color depending on your data values. For instance, points with low values could be displayed with small symbols and points with high values could be displayed with large symbols. Please note that graduated colored polygon layers do not count for use of this skill.

Aggregating attribute fields. Combining attribute fields in ArcMap or Excel to create a new attribute. Text at the bottom of the layout or in the write-up should indicate how the aggregated field was derived, such as: “NHWhite=Hispanic+Black+Asian+OtherAPI.” This is not to be confused with creating an index; see below.

Creating Indices. An index is an indicator of a specific phenomenon. It is a function of two or more existing variables. You may create new indices in ArcMap or Excel, or calculate established indices such as “transit dependency,” “racial heterogeneity,” “intact families,” or “needy.” Text at the bottom of the layout should state the formula for the index.

Attribute subset selections. Geographic boundaries which have been selected out of a larger shapefile using Select By Attributes in order to create a smaller shapefile from a larger one. For instance, a major highway theme could have been created from a streets file. Text at the bottom of the layout or a skills slide should indicate how the new shapefile was created, e.g. “MajorHighways file was created by querying LA_streets for ‘FCCC=A11’ and exporting data to a new layer.”

Geographic subsets. Geographic boundaries which have been selected out of a larger shapefile using Select by Location in order to create a smaller shapefile. For instance, a layer with census tracts for Pasadena could have been created from the census tract file for LA County. Text at the bottom of the layout should indicate how the new shapefile was derived, such as “Tracts_pas was created by selecting tracts in the View from tracts and converting to shapefile”.

Distance. Using the measurement tool to measure the distance between two significant points or boundaries. You could then use ArcGIS graphics tools to draw a line from two points to show the distance. This is distinct from using buffers to symbolize distance.

Buffering. Creating a buffer of specific distance that demonstrates spatial relationships. Consider displaying buffers as an outline or with a hatched or semi-transparent fill pattern. Whenever possible, clip buffers to the coastline.
Geoprocessing. Creating and modifying layers using geoprocessing functions such as dissolving a theme based on attributes, clipping one theme based on another, etc.

Geocoding. Assigning geographic locations to attribute data, such as mapping the locations of hospitals in an area using addresses.

Custom shapefile creation. Generate your own custom data by creating your own shapefile by "drawing" points, lines, or polygons on the map. You can also import a Google My Maps layer as a kml file into ArcMap to fulfill this skill.

OTHER: Are you using other geoprocessing tools not mentioned here? Or are you performing some task that you think constitutes skillful mapmaking? Consult with the instructors to see if it might count.

In addition, all layouts should experiment with various shading and symbology methods. Layouts should be formatted for presentation, including proper layers and labels. For instance, percentages such as "0.01-0.03" should display on the map as "0.1%-0.3%". When possible, maps should explore various ways of representation, and you should try to not repeat the same map with different attributes. Lastly, you should include a slide that shows the skills that you used or subtly document the skills on each layout.

Final Project

Organize your final project around the topic that you will present to the class. For the final, you will go into more depth about your topic. You are required to create and display a minimum of eight layouts and use nine different skills. The three listed below are required and the remaining six you may choose. Some of your eight final maps may be from your midterm presentation. However, if you re-use maps, you should make sure to address any comments made on them during the midterm.

You are required to meet the following THREE requirements:

- **Modeling.** Creating a model automates data manipulation workflows. The model diagram should be converted into a jpg by making a screenshot of it after you run it. Include the jpg at the end of the presentation in the notes section or as a slide following the relevant map layout.

- **Distance.** To integrate some measure of distance you could create a buffer or concentric zones; or you could display elements according to their distance from a central feature. You could also use the graphics features of the software to add lines or circles which display distance or proximity on your map. Using nearest neighbor functions from ArcTool box also qualifies.

- **Original data.** By 'original' we mean a layer that is not a GIS ready dataset, created using data from various sources such as an agency you are working with, an Internet source or your independent research. You will be required to turn this original data into map layers through
processes such as geocoding, drawing new shapefiles using satellite imagery, rendering x,y data, etc.

For the remaining six requirements you may choose from the following:

- Extracting Information from a buffer.
- Charts, Images. Charts or pictures can make a unique contribution to explaining your layout and issue. Charts can be made in ArcMap or other programs such as Excel.
- Hotspot Analysis (Spatial Analyst)
- Network Analysis (Network Analyst)
- Spatial Statistics
- Time based analysis
- Any of the skills listed for the midterm

Each layout should be distinct and should display your data in a clear and uncluttered way. Vary your layouts; do not make a series of maps using a single layout. You should also vary the data sources you drawn upon: do not use only Census data, for example. Also, every data element should make some contribution to your project; don’t add superfluous layers in order to meet the requirements. Finally, each layout must include titles, your name, a scale bar, a north arrow and a legend, or, if you really want to omit one of these, a strong reason why that element is not present.

PowerPoint Presentation
Each student will present their project in class. In most cases, 8-12 exported images (Jpegs) of layouts should be sufficient for the oral presentation. Each slide should make a unique contribution to answering your planning or policy issue. Make sure that your layouts are free of clutter and confusing colors or symbols. Keep captions and titles clear and direct. At least one map should be a descriptive map that provides a general overview of your area of interest. Your additional layouts should express the major points you want the instructors to review when evaluating your map-making skills. Your project should be posted to CCLE prior to your presentation.

Final Project Report
The final project requires a final report that incorporates your layouts, analysis and interpretation. This report must contain:

- Brief introduction of your planning or policy issue
- References to relevant literature where applicable
- Description of each layout
- Explanation of the formulation of your question
- Sources of your geographic and attribute data
- Formulas for any indices or aggregated fields
- Conclusion that summarizes your findings, evaluates the usefulness of using GIS to analyze your type of issue, and presents your recommendations and/or solutions on the issue of analysis
• You may also comment on the process of attaining and/or manipulating data and any other problems or difficulties you may have encountered
• Brief explanation of the GIS methods you used

Avoid unnecessary technical language. Aim to produce a professional document that you could bring to a job interview.