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Teaching Assistant: TBD  
[Office] XXX  
[Office Hours] XXX  
[Email] XXX

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COURSE DESCRIPTION

The course is designed to introduce students to (i) a method of presenting spatial/geographical data using GIS software, ArcGIS 10.5 and (ii) descriptive and introductory level statistical methods for analyzing spatial data. The course will provide students with hands-on examples of spatial data visualization using ArcGIS (including Spatial Analyst, Geostatistical Analyst and 3D Analyst) and the knowledge of most commonly used spatial analysis methods such as “hot-spot analysis” and “kriging”. Students are also given introduction to additional spatial statistical analysis methods that work complementary to spatial data visualization. All students are expected to have basic knowledge of basic statistics (PUBP704 or equivalent) although we will spend the first class reviewing necessary statistical concepts.

COURSE TIME AND LOCATION
Time: Tuesday 7:20 – 10:00 PM  
Location: ARL206

COURSE TEXTS

- REQUIRED TEXTS
  - *Getting to Know ArcGIS for Desktop* (5th Edition) by Michael Law and Amy Collins., ESRI Press, 2015. If you have an older edition (by Tim Ormsby, et al.), no need to purchase this edition. You will, however, need to identify the sections that are comparable to the sections we read from the new edition during the course.

- ADDITIONAL RECOMMENDED BOOKS FOR ADVANCED STUDENTS
  - *Interactive Spatial Data Analysis* by T.C. Bailey and A.C. Gatrell (B&G), Prentice Hall
  - *Handbook of Applied Spatial Analysis* by Fischer et al., 2010. **No need to purchase the book.** We will refer to only a few chapters in this book, and the book is available on four-hour reserve at the GMU Arlington Library. You can view the catalog record at [http://magik.gmu.edu/cgi-bin/Pwebrecon.cgi?BBID=1969289](http://magik.gmu.edu/cgi-bin/Pwebrecon.cgi?BBID=1969289).

COURSE SOFTWARE

- ArcGIS 10.5 (ESRI Corp)
- Each student will receive a “1-year trial CD” of ArcGIS 10.5 during the first class. The first textbook listed above also comes with a 180-day trial CD of ArcGIS 10.5. **These CDs are for Windows users.**

For Mac Users, there are following options.

1. Bootcamp: Using disk utility, partition the hard-drive into two. Install Windows on one partition. Use Windows as OS upon start-up and use any windows-based software including ArcGIS. Windows purchase required.
2. Parallel Desktop: This product is an emulator and is available at Patriot Computers at Johnson Center at $43 for students (regular price is $80). Windows purchase required.
3. VMWare Fusion: This product is an emulator and is available at Patriot Computers in Johnson Center at $50 for students (regular price is $80). Windows purchase required.
4. Remote Access: Install ArcGIS on a PC with Windows and remotely access that computer to run your application from a browser (using network). If you already have a PC with Windows that you can access anytime, this is a no cost option.

You can also refer to the following URL for general software requirement and solutions suggested by ESRI.

2. Solutions for Mac Users

If none of these works for you, we can discuss other possible solutions during the first class.

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### COURSE TOPICS

| Introduction to GIS software | ArcGIS 10.5  
Spatial Analyst  
Geostatistical Analyst  
3D Analyst  
Tracking Analyst |
|-----------------------------|-------------------------------------|
| Spatial Point Pattern Analysis | Nearest-Neighbor Methods  
K-Function Methods |
| Continuous Spatial Data Analysis | Variogram Methods  
Kriging Methods |
| Regional Data Analysis | Spatial Regression Methods  
Maximum Likelihood Estimation  
Spatial Diagnosis |

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### LECTURE SCHEDULE

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Date</th>
<th>Topic</th>
<th>Assignment Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 29</td>
<td>GMU Spatial Data Collection by Arlington Librarians: Helen McManus, Ms. Wendy Mann and Ms. Joy Suh</td>
<td></td>
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</tbody>
</table>
| 2       | Feb 5 | ArcGIS Basics and Tutorial 1 - Making a thematic map  
Course Description  
Introduction to GIS and Spatial Data Analysis | |
| 3       | Feb 12 | ArcGIS Basics and Tutorial 2 - Making a choropleth map and representation of point (event) data | PS1 distributed |
| 4       | Feb 19 | Introduction to Point Pattern Analysis & Statistics Review (for the point pattern analysis)  
GIS Application to Red Wood Data | |
| 5       | Feb 26 | Point Pattern Analysis  
Nearest Neighbor Distance Analysis  
Global K-function Analysis  
GIS Application to Redwood and Fire Station Data | PS1 due |
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Mar 5</td>
<td>ArcGIS Tutorial – Geocoding</td>
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<tr>
<td></td>
<td>Embassy ZIP &amp; Address Geocoding</td>
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<td></td>
<td>PS2 distributed</td>
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<tr>
<td>Mar 12</td>
<td><strong>SPRING BREAK (NO CLASS)</strong></td>
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<tr>
<td>Mar 19</td>
<td><strong>Real world GIS applications by (TBD)</strong></td>
<td>PS2 due</td>
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<tr>
<td>Mar 26</td>
<td>Local K-function Analysis</td>
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<td></td>
<td>Kernel Density Estimation</td>
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<td></td>
<td>Space – Time Processes (A brief introduction)</td>
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<td></td>
<td>Application to Larynx cancer data (Spatial Analyst)</td>
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<td></td>
<td>PS3 distributed</td>
<td></td>
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<tr>
<td>Apr 2</td>
<td>Analysis of Spatially Continuous Data</td>
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<tr>
<td></td>
<td>Spatial Interpolation: Tessellation and Inverse Distance Weighting (IDW) techniques</td>
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<td></td>
<td>Application to PCB data (3D Analyst)</td>
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<td>Apr 9</td>
<td><strong>Literature Review of GIS Studies</strong></td>
<td>PS3 due</td>
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<tr>
<td>Apr 16</td>
<td>Analysis of Spatially Continuous Data continued</td>
<td></td>
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<tr>
<td></td>
<td>Covariogram, Correlogram, Variogram, and Semivariogram</td>
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<tr>
<td></td>
<td>Simple, Ordinary and Universal Kriging technique</td>
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<td></td>
<td>Application to Vancouver cobalt data (Geostatistical Analyst)</td>
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<tr>
<td></td>
<td>PS4 distributed</td>
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<tr>
<td>Apr 23</td>
<td>Analysis of Area Data</td>
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<td></td>
<td>Testing for spatial autocorrelation (Moran’s I, G-statistics)</td>
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<td></td>
<td>Representation of area data (Centroids)</td>
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<tr>
<td>Apr 30</td>
<td>Analysis of Area Data</td>
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<tr>
<td></td>
<td>SAR and SL models</td>
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<td></td>
<td>GIS Applications to Tobacco and Rabies data (Tracking Analyst)</td>
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<tr>
<td>Apr 30</td>
<td>Analysis of Area Data Continued</td>
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<tr>
<td></td>
<td>SAR and SL models</td>
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<tr>
<td></td>
<td>GIS Applications to Tobacco and Rabies data (Tracking Analyst)</td>
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<tr>
<td>Mar 16</td>
<td><strong>Project Presentations</strong></td>
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<tr>
<td>May 14</td>
<td><strong>Project Presentations (Exam Period)</strong></td>
<td>Final paper due</td>
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**READING LIST, LECTURE SLIDES AND HANDOUTS**

Reading list and the materials for the following week will be provided at each class. Lecture slides, handouts, datasets and program files will be uploaded to the blackboard website before noon on the day of each class. The first slide of lecture slides always lists the reading for the following week. Students are encouraged to download all the files into your laptop before each class.

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LEARNING OUTCOME MEASURES

1. Knowledge and understanding
   - Students should be familiar with various GIS tools / software and spatial data analysis techniques
   - Students should be able to identify the topics for which spatial analysis can be most appropriate and effective in understanding policy questions
   - Students should be able to read and understand the journal articles that involves GIS and spatial analysis
   - Students should be able to critically assess policy arguments, comments, reports and other materials that use GIS and spatial analysis techniques

2. Develop quantitative and qualitative skills
   - Students should be able to visualize spatial data using at least one GIS software and conduct basic spatial data analysis to examine various policy issues.
   - Students should be able to interpret the outputs of various basic spatial data analysis
   - Students should learn how to find, collect, organize and clean spatial datasets necessary to analyze the topic of their interests.

3. Professional development and leadership
   - Students should learn working effectively in a team setting through homework assignment and course project.
   - Students should learn how to make professional presentations through a course project.
   - Students should learn how to seek assistance when needed and communicate effectively with classmates, TA and Professor.
   - Students should learn how to deliver assignments and outputs in a timely fashion.

COURSE GRADING

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>4 Problem Sets</td>
<td>44% (11% each)</td>
</tr>
<tr>
<td>Project Presentation / Paper</td>
<td>50%</td>
</tr>
<tr>
<td>Class Participation</td>
<td>6%</td>
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</tbody>
</table>

HOMEWORK POLICY

All assignments will be uploaded to the blackboard website two weeks before the deadline. Students are expected to submit their work in hard copy format on the due date. Late submission will be penalized (unless notified in advance for an understandable reason). Students are allowed to work as a group for homework assignments, although the final product must be original.

PROJECT INFORMATION

1. PROJECT REQUIREMENTS
   Students can conduct a project either on your own or by teaming with another student (2 students per team maximum). Each student/group is expected to undertake a case study involving a spatial data visualization using
ArcGIS and spatial statistical analysis of some data set. Each student/group is expected to find a dataset used for the project (from websites or elsewhere) and make a brief (about 20-25 minutes) presentation towards the end of the semester. The selected websites that contain useful datasets are listed in the following section.

The report is expected to be around 20 pages (double spaced). The report should state/include: (i) motivation of the problem and key question/s; (ii) descriptive analysis of your data and the associated data visualization; (iii) the spatial statistical model and the analysis; and (iv) summary and discussion of your findings. All source datasets and material used in the analysis should be cited explicitly. Each group is expected to submit an electronic form of the presentation. Each group is also expected to submit both a hardcopy and an electronic form of the report.

2. PAST PROJECT EXAMPLES
Past examples of project presentations and papers are uploaded to the blackboard course website.

3. NOTE ON “NEW VOICES IN PUBLIC POLICY”
I will consider nominating the very best papers in this course for publication in New Voices in Public Policy. New Voices is a student- and faculty-reviewed journal that shares SPP's finest student work with the rest of the world.

SELECTED SPATIAL DATA WEBSITES

http://clearinghouse1.fgdc.gov/
http://www.csiss.org/clearinghouse/select-tools.php
http://data.geocomm.com
http://datagateway.nrcs.usda.gov/GatewayHome.html
http://seamless.usgs.gov/
http://www.collinssoftware.com/freegis_by_region.htm
http://www.arcgisonline.com/home/
http://www.esri.com/products/index.html#data
http://gos2.geodata.gov/wps/portal/gos
http://fisher.lib.virginia.edu/index.html
http://www.gisdatadepot.com
http://gis.about.com
http://www.maproom.psu.edu/dcw/
http://www.lib.ncsu.edu/gis/
http://www.fedstats.gov/mapstats/
http://factfinder.census.gov/servlet/BasicFactsServlet
http://www.nationalgeographic.com/maps/
http://nationalatlas.gov/natlas/natlastart.asp
http://www3.cancer.gov/atlasplus/
http://www.geofabrik.de/data/shapefiles.html
http://geodata.grid.unep.ch/
http://www.edenextdata.com/?q=content/global-gis-datasets-links-0
ACADEMIC ACCOMMODATIONS FOR A DISABILITY

If you are a student with a disability and you need academic accommodations, please email and then make an appointment to see Professor Fritschler or Rudder and contact the Disability Resource Center (DRC) at 703-993-2474. All academic accommodations must be arranged through the DRC.

SCHAR SCHOOL POLICY ON PLAGIARISM

The profession of scholarship and the intellectual life of a university as well as the field of public policy inquiry depend fundamentally on a foundation of trust. Thus any act of plagiarism strikes at the heart of the meaning of the university and the purpose of the School of Public Policy. It constitutes a serious breach of professional ethics and it is unacceptable.

Plagiarism is the use of another’s words or ideas presented as one’s own. It includes, among other things, the use of specific words, ideas, or frameworks that are the product of another’s work. Honesty and thoroughness in citing sources is essential to professional accountability and personal responsibility. Appropriate citation is necessary so that arguments, evidence, and claims can be critically examined.

Plagiarism is wrong because of the injustice it does to the person whose ideas are stolen. But it is also wrong because it constitutes lying to one’s professional colleagues. From a prudential perspective, it is shortsighted and self-defeating, and it can ruin a professional career.

The faculty of the School of Public Policy takes plagiarism seriously and has adopted a zero tolerance policy. Any plagiarized assignment will receive an automatic grade of “F.” This may lead to failure for the course, resulting in dismissal from the University. This dismissal will be noted on the student’s transcript. For foreign students who are on a university-sponsored visa (eg. F-1, J-1 or J-2), dismissal also results in the revocation of their visa.

To help enforce the SPP policy on plagiarism, all written work submitted in partial fulfillment of course or degree requirements must be available in electronic form so that it can be compared with electronic databases, as well as submitted to commercial services to which the School subscribes. Faculty may at any time submit student’s work without prior permission from the student. Individual instructors may require that written work be submitted in electronic as well as printed form. The SPP policy on plagiarism is supplementary to the George Mason University Honor Code; it is not intended to replace it or substitute for it.

(http://www.gmu.edu/facstaff/handbook/aD.html)

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