Syllabus for GEOG653

**Instructor**
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*Office Hours:* Wednesdays (3:00pm-5:00pm)
(Additional office hours can be scheduled by appointment via email or phone.)

**Teaching Assistant**
*Office Hours:* TBA (Email to make appointment)

**About the Course**

**Time:**
- Lecture: 5:30 PM - 7:30 PM, Wednesdays
- Lab Section#1: 5:30 PM - 7:30 PM, Thursdays

**Location:**
- Class room for Lectures: Lefrak Hall 1158
- Lab: Lefrak Hall 1136
- Online – (URL to WebEx virtual room will be posted on ELMS before 5:30pm)

**Description**
This course is designed to help student develop a systematic and in-depth understanding of spatial analysis methods and learn practical skills in using GIS and spatial analysis to discover features of spatial distribution. The class covers the methods of spatial analysis including measuring aspects of geometric features and identifying spatial patterns of geospatial objects that are represented as point, line, network, areal/polygon data, and 3-D surfaces. Spatial statistics, geospatial processing, and modeling will be used for analyzing the data. In terms of the software used in this class, we will be primarily using ArcGIS Pro 2.1 which is a new platform that represents the trend in GIS field and expected to replace Desktop ArcGIS in a few years. We also use Desktop ArcGIS10.6. The material will be presented in lectures, lab assignments, exercises, readings, and final project.

**Textbooks**
No required textbooks. However, the following books are recommended for reading:

**Assignments**
There are totally eight (8) lab assignments to be completed. Each of these lab assignments will count 9% of the final grade. Lab reports are due by the date specified in the Course Schedule. Late submission of lab reports will result in a reduction of the grade for that assignment of 10 points (out of 100 in total) per day. However, in some rare situations (e.g. medical or family emergency), if you need extra time, you will have to contact the instructor before the due date so that the deadline may be extended.

There are also eleven (11) exercises that are optional and for your practice.
Final Project

Because this course is designed to be practical emphasizing on GIS analysis, a final project is considered a better option compared to a final exam. This will allow students spend more time focusing on how to use GIS as a tool in their study/research/work.

A written proposal of research (~2 pages) must be submitted in class by the date specified in the Course Schedule. The proposal should: (1) identify research problem; (2) provide background information; (3) list objectives; and (4) describe data and methods. Students are encouraged to contact the instructor early during the semester to discuss potential topics and scope. This proposal will be worth 5% of your final grade.

The project must be carried out individually and independently. This project should be limited in scope and designed for completion during the semester. Students are required to report their research project in a poster format. The poster must be submitted by the deadline and it will account for 20% of your final grade.

Grading

The distributions of grade are:

- Lab Assignments = 72%
- Final Project = 25%
- Quiz = 2%
- Discussion/Participation = 1%

The plus/minus grading system will be used to assign student grades which will be determined as follows:

- 97-100 = A+
- 93-96.99 = A
- 90-92.99 = A-
- 87-89.99 = B+
- 83-86.99 = B
- 80-82.99 = B-
- 77-79.99 = C+
- 73-76.99 = C
- 70-72.99 = C-
- 67-69.99 = D+
- 63-66.99 = D
- 60-62.99 = D-
- <60 = F

Minor adjustments to this scale might be made based on the performance of the class as a whole.
## Course Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Lecture Topics*</th>
<th>Readings</th>
<th>Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Feb 28</td>
<td>Course Overview&lt;br&gt;Introduction to Spatial Analysis&lt;br&gt;Introduction to ArcGIS Pro&lt;br&gt;Introduction to ArcGIS Online&lt;br&gt;Demonstrations and Examples</td>
<td>Lecture Slides</td>
<td>Exercise 1,2,3</td>
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<td>2</td>
<td>Mar 7</td>
<td>Fundamental Spatial Analysis&lt;br&gt;– Spatial Query&lt;br&gt;– Spatial Join&lt;br&gt;– Overlay Operations&lt;br&gt;– Buffering&lt;br&gt;ModelBuilder</td>
<td>Mitchell 1-20&lt;br&gt;Collins &amp; Law, Chap1,2</td>
<td>Lab 1 out&lt;br&gt;Exercise 4</td>
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<td>3</td>
<td>Mar 14</td>
<td>Point Pattern Analysis&lt;br&gt;– Geometric Measurements&lt;br&gt;– Quadrat Count Analysis&lt;br&gt;– Kernel Density Analysis&lt;br&gt;– Nearest Neighbor Analysis</td>
<td>Mitchell 21-50, 80-103, 135-145, 147-162&lt;br&gt;Collins &amp; Law, Chap3,4</td>
<td>Lab 1 due&lt;br&gt;Lab 2 out&lt;br&gt;Exercise 5</td>
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<td>4</td>
<td>Mar 21</td>
<td><strong>Spring Break</strong></td>
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<td>5</td>
<td>Mar 28</td>
<td>Line Data Analysis&lt;br&gt;– Line Length&lt;br&gt;– Line Density&lt;br&gt;– Line Direction&lt;br&gt;– Line Orientation</td>
<td>Mitchell 51-60&lt;br&gt;Collins &amp; Law, Chap5</td>
<td>Lab 2 due&lt;br&gt;Lab 3 out&lt;br&gt;Exercise 6</td>
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<td>6</td>
<td>Apr 4</td>
<td>Network Analysis&lt;br&gt;– Routing&lt;br&gt;– Service Area&lt;br&gt;– Closest Facilities&lt;br&gt;– O-D Cost Matrix&lt;br&gt;– Location-Allocation Analysis</td>
<td>Lecture Slides&lt;br&gt;Collins &amp; Law, Chap6</td>
<td>Lab 3 due&lt;br&gt;Lab 4 out&lt;br&gt;Exercise 7</td>
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<td>7</td>
<td>Apr 11</td>
<td>Areal Analysis&lt;br&gt;– Spatial Autocorrelation&lt;br&gt;– Joint Count</td>
<td>Mitchell 104-132, 163-180&lt;br&gt;Collins &amp; Law, Chap7</td>
<td>Lab 4 due&lt;br&gt;Lab 5 out&lt;br&gt;Exercise 8</td>
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<td>8</td>
<td>Apr 18</td>
<td>Surface Analysis&lt;br&gt;– Spatial Interpolation&lt;br&gt;– Distance Analysis&lt;br&gt;– Density Analysis&lt;br&gt;– Surface Analysis Operations&lt;br&gt;Map Algebra</td>
<td>Lecture Slides&lt;br&gt;Collins &amp; Law, Chap8</td>
<td>Lab 5 due&lt;br&gt;Lab 6 out&lt;br&gt;Exercise 9</td>
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<tr>
<td></td>
<td>Date</td>
<td>Topic</td>
<td>Material</td>
<td>Assignment</td>
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<td>9</td>
<td>Apr 25</td>
<td>3D Analysis - Draping - Extrusion - Line-of-Sight - Viewshed - Skylines - Volumetric Analysis - Animation</td>
<td>Lecture Slides Collins &amp; Law, Chap9</td>
<td>Lab 6 due Lab 7 out Exercise 10</td>
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<td>10</td>
<td>May 2</td>
<td>3D in ArcGIS Pro CityEngine Other GIS software and tools QGIS</td>
<td>Lecture Slides Collins &amp; Law, Chap10</td>
<td>Lab 7 due Lab 8 out Exercise11</td>
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<td>11</td>
<td>May 9</td>
<td>Getting to Know Business Analyst New Development in GIS Summary</td>
<td>Lecture Slides</td>
<td>Lab 8 due Final project proposal due</td>
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<td>12</td>
<td>May 16</td>
<td>Final Project</td>
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<td>Final project due on May 18</td>
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**Note:**

Besides lectures, there will be lab sessions which may cover a variety of topics depending on the interests and needs from students.

This is a tentative schedule and may be adjusted and updated to better suit our class.