GEO 6166 (Spring 2014)
Advanced Quantitative Methods for Spatial Analysis
Section:  # DEPT (3.0 credit hours)
Lectures:  T (Tuesdays) → periods 4-6 (10:40AM – 1:40PM)
Location:  TUR Room 3012 (Turlington Hall)
Instructor:  Timothy J. Fik, Ph.D.

OFFICE HOURS:
Tuesdays:  8:30AM – 10:15AM; and 2:00PM – 3:35PM
Thursdays:  12:30PM – 3:00PM; and 4:00PM – 4:45PM
Office Location:  3137 Turlington Hall
PO Box 117315, Department of Geography, University of Florida
Gainesville, FL 32611-7315
Or by appointment: (352) 392-0494
fik@ufl.edu

Pre-requisites
The following courses are pre-requisites: GEO 3162c/GEO 6160 -- Introduction to Quantitative Methods for Geographers (or equivalent) and GEO 4167c/GEO 6167 -- Intermediate Quantitative Methods (or equivalent). Students must first complete the Intro/Intermediate Quantitative Methods sequence (or its equivalent) and/or must have permission from the Instructor to register for this course or to take this course concurrently with GEO 4167c_6161.

Course Description
This course surveys selected topics in Advanced Quantitative analysis and provides a fairly detailed overview of widely used techniques for spatial data analysis. It also provides a series of highly focused discussions on a few of the more popular techniques in spatial statistics and spatial econometric modeling. Emphasis is on the critical examination and analysis of spatial data and point patterns, trend-surface modeling and interpolation, count data modeling, cluster and hot-spot detection, process change statistics in both space and time, and spatial regression models.

Selected Topics include…
Point-Pattern Analysis & Modeling
Kriging Methods and the Semi-Variogram
Spatial Autocorrelation & Measures of Spatial Dependence (Global & Local)
Selected Topics in Advanced Econometrics (SUR, IV methods, Panel Data Regression)
Spatial Econometrics: Spatial Autoregressive and Spatial Moving Average Models
Maximum Likelihood Estimation and Model Assessment
Inverse Weighting, Kernel Density Methods, and Spatial Interpolation Methods
Geographically Weighted Regression (GWR)
Poisson Regression and Negative Binomial Regression
Data Transformation Techniques to Achieve Normality
Cusum and Process Change Statistics
Time-Space Clustering Statistics
Hot-Spot Analysis (K-functions, Kulldorff, Getis G, Rogerson, etc.)
Course Components (out of 400 possible points):
1. 2 Lab Assignments (40 points each = 80 points) – 20%
2. Final Term Project/Paper (200 points) – 50%
3. In-Class Presentation of Final Term Project (60 points) – 15%
4. Class Attendance and Participation (60 points) – 15%
   [Note that regular attendance is required and attendance will be taken].

Proper classroom etiquette is expected (talking, the use of cell/smart phones, surfing the web, or engaging in any form of social networking is strictly prohibited during lecture… and will not be tolerated).

Readings: Recommended and Highly Recommended*

*General—Spatial Analysis

Advanced Point-Pattern Analysis

Cluster Detection & Spatial Modeling

Spatial Epidemiology

Process Change & Cusum Statistics

Spatial Econometrics

A note on computer software
Students may choose from a variety of available software to assist them in the completion of their labs and/or their final term project (based on what is best suited for your research interests and/or your project needs). Note that this is a course that surveys various techniques and methods… and is not a course in how to use specific software packages. Students are expected to learn software on their own time, and it is recommended that students take advantage of learning Spatial Analyst for ArcView GIS (requires GIS background, available in Geography Labs), including GWR – Geographically Weighted Regression (version 3x) or any of the Free downloadable programs or options:

Crime-Stat (for Point-Pattern Analysis and Nearest-Neighbor Statistics)
GeoDa (for Spatial Auto-Regressive/SAR model estimation)
SatScan (for Point-Pattern Analysis, Pattern Recognition and Spatial Autocorrelation)
--Programming in the language R
**Students with Disabilities**

Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.

**Student Performance Evaluation and Grades**

A student’s overall performance in the course will be determined by the total points earned out of a possible 400 points, and based on the overall percentage:

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<th>Grade Value</th>
<th>Percentage</th>
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<tr>
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<tr>
<td>90.0-90.9%</td>
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<td>87.0-89.9%</td>
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<td>80.0-86.9%</td>
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**Grade Values for Conversion**

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Penalty for "late" labs (submitted after due dates, TBA) = –20 points per each day late.

*Note that it is the student’s responsibility to acquire copies of the labs and complete the lab assignments by the assigned due dates. Students have the option of creating their own labs for the course (with permission from the Instructor). Completed Labs and associated files may be sent to the instructor via e-mail or as an e-file attachment (.pdf/.doc/.docx/.ppt/.pptx) or submitted as hardcopy.*
**Term Project: Applied Spatial Analysis**

The term project must demonstrate a working knowledge of advanced statistical methods for spatial data analysis in an application involving cross-section, spatial, temporal, and/or spatio-temporal data to address a specific research question. Students are expected to test a series of designated hypotheses which fall under a more general research objective and/or problem statement. The project must incorporate techniques or methods discussed in the course or extensions thereof. Research topics must be pre-approved by the instructor, and students are responsible for (a) acquiring, collecting, and managing their own data and databases; (b) model construction, development, and assessment, as well as carrying out all related computational and diagnostic procedures; and (c) the production of a final write-up (which is to include a brief literature review, overview of the research problem, and a summary and conclusion section). The final write-up must be submitted along with all supporting materials…including a copy of the data (in spreadsheet or database form), relevant output and summary tables, and technical appendices which demonstrate the mechanics or mathematics of the techniques used in the analysis. Students are responsible for analyzing their own data and results, and are required to write and submit a final paper that is not to exceed 25 pages in length (excluding tables, charts, generated output, maps, and/or technical appendices).

**Term Project Due Date (Submission of Final Term Paper & Powerpoint):**
Final scheduled class day -- Tuesday, April 23rd, 2013

Note: projects/papers will be collected at the end of class for those students submitting their papers in hardcopy form, or by 3:00PM for those submitting their projects and presentation electronically; that is, via e-mail). NOTE: Students must be prepared to present their findings to the class in a short 20-25 minute power-point presentation (Time/Date: To Be Determined). No Late Projects will be accepted. All Projects and related materials must be submitted by the posted due date above.

**Term Project Guidelines (Advanced Quantitative Methods)**

The term project/paper/report is worth a total of 200 points – 50% of your grade for this class. Your term project/paper/report and .ppt/.pptx presentation is worth a total of 260 points – 65% of your grade. Hence, great care should be taken to produce a paper/project and a presentation that clearly demonstrate a working knowledge of the methods used in your analysis.

To sum, each student is required to submit a term paper that provides an overview of the model and methods used in their analysis, and a detailed discussion of the findings and results. All relevant graphs, plots, charts, graphics, maps, and statistical summary tables should be submitted along with a summary and write-up in a paper that is not to exceed 25 total pages in length. Note that your accompanying power point presentation should be (a) limited to no more than 30 slides, and (b) submitted as both a .ppt and .pptx file on CD or flash drive or via e-mail to fik@ufl.edu by no later than Tuesday, April 22nd, 2014, by 3:00PM EST (Eastern Standard Time). Attach related computer-generated output as an appendix to your paper (note that these pages do not count as pages of text).

The write-up/paper must be typed, double-spaced, using standard 12pt font (e.g., Times Roman or Helvetica) with standard 1” margins, with a discussion that includes relevant background information on your subject of interest, a literature review, a problem statement, hypotheses, etc. If submitting paper is submitted on CD or flash drive, please submit file as both a Word .doc and .docx file.
The term paper/project should have a cover/title page clearly showing the student’s name, UF ID#, and the title of the work. Note: the cover page does not count as a page of text.

All in all, the write-up should include the following items…

**Title/Cover Page**

**Overview of Project/Topic or Introduction**

**Statement of the Problem**

**Literature Review and Relevant Background Information**

**Hypotheses (clearly and specifically defined)**

**Description of variables, model, and method(s), with theoretical justification of the model/methods utilized**

**General description of the data used in the analysis**

**Summary table(s) highlighting the pertinent results and discussion and interpretation of results**

**Summary of Results/Relevant Findings/Conclusions**

**Implications and Directions for Future Research**

**Statistical or Mathematical Appendix/Appendices**

**Computer-generated output/supporting material**

**Literature cited page(s) or Bibliography**

Term Projects can be submitted on CD, flash drive, as Hard Copy, or may be sent to the instructor via e-mail – fik@ufl.edu (please keep file size under 3 MB). Again, the cover/title page, statistical appendix, and bibliography do not count as official pages of text. In addition (if submitting your project in hardcopy form), the write-up must be page-numbered and the paper should be securely stapled or bound together. It is not the instructor’s responsibility to bind or staple together the pages of your project/paper.

Final copies of the Term Paper/Project are to be submitted to the Instructor no later than the specified “due date” and “time” as specified in this syllabus. No late projects will be accepted for any reason. There are no exceptions. **Failure to turn in a term project by the due date and time will result in a final grade of E for the course (there are no exceptions).** In short, no incompletes will be given out this term.

**Some Important Dates**

**First Advanced Quant Class: Tuesday, January 7th, 2014**

**Last Advanced Quant Class and Project Due Date: Tuesday, April 22nd, 2014**

(Project due by 3:00PM, EST)

**Spring Break: March 1st – March 9th, 2014**

**GOOD LUCK and GOOD JOURNEY!**