Department of Geography
UNIVERSITY OF FLORIDA**, SPRING 2020**
GEO 4167c / GEO 6161 (3.0 credit hours) Course # 14827 / 14858

Intermediate Quantitative Methods

Instructor: Timothy J. Fik, Ph.D. (Associate Professor)
Prerequisite: ***GEO 3162 / GEO 6160*** or equivalent
Lecture Time/Location: **Tuesdays, Periods 3-5: 9:35AM-12:35PM / Turlington 3012**
Instructor's Office: 3137 Turlington Hall
Instructor's e-mail address: fik@ufl.edu

Formal Office Hours
Tuesdays -- 1:00PM – 4:30PM
Thursdays -- 1:30PM – 3:00PM; and 4:00PM – 4:30PM

Course Materials (Power-point presentations in pdf format) will be uploaded to the on-line course Lecture folder on Canvas.

Course Overview

GEO 4167x/GEO 6161 surveys various statistical modeling techniques that are widely used in the social, behavioral, and environmental sciences. Lectures will focus on several important topics… including common indices of spatial association and dependence, linear and non-linear model development, model diagnostics, and remedial measures. The lectures will largely be devoted to the topic of **Regression Analysis/Econometrics (and the General Linear Model)**. Applications will involve regression models using cross-sectional, quantitative, qualitative, categorical, time-series, and/or spatial data. Selected topics include, yet are not limited to, the following:

Classic Least Squares Regression plus Extensions of the General Linear Model (GLM)
Matrix Algebra approach to Regression and the GLM
Join-Count Statistics (Dacey's Contiguity Tests)
Spatial Autocorrelation / Regression Error Assessment
Dummy Variables & Interactive Variables
Overview of Step-wise (Data Mining) Regression Procedures
Basic Model Diagnostics (Normality, Heterogeneity of Variance, etc.)
Trend Surface Analysis and Polynomial Regression for Geo-coded data
Measures of Leverage & Influence (Cook's distance, Hat values, DFitts, etc.)
Robust Regression Models and M-Estimators
Time-Series Analysis (including DL, ARMA, and ARIMA models)
Model Specification, Functional Form, and Data Transformations
Overview of LPM, Probit, and Logit Models
Regressions Trees
Introduction to Spatial Regression Models (SAR, CAR, S Filters) and Spatial Econometrics
Introduction to Principal Components and PC Regression *time permitting*

Course Objectives are three-fold:

(1) Familiarize students with procedures, statistics, diagnostics, and remedial measures commonly used in Regression Analysis and Intermediate-level Econometrics

(2) Allow students to gain experience in applied quantitative methods and modeling through various take-home lab assignments and the completion of a final term project; and

(3) Give students experience in preparing a research paper in which they identify a research question and evaluate hypotheses, construct a model, generate statistical results, and present statistical findings for a project of their choosing.

Required and Recommended Reading Materials

Basic Econometrics, Damodar Gujarati (2004) 4th edition – this is the required textbook for course.

Students are responsible for reading all material covered in this book as assigned. Note that although this book is couched from an "econometrics perspective", the techniques and procedures presented have universal applicability in the social and environmental sciences.

Statistical Methods for Geography, by P. Rogerson (2001) or 2nd edition (2006); Sage Publications. (highly recommended)

Multiple Regression in Practice, by Berry & Feldman, Quantitative Applications in the Social Sciences #50, Sage Publications. (highly recommended)

Time-Series Analysis: Regression Techniques, Ostrom, Quantitative Applications in the Social Sciences #9, Sage Publications (highly recommended).

Note that I also suggest that you read the regression analysis chapters in Burt, Barber, and Rigby's "***Elementary Statistics for Geographers***" (3rd edition), Guilford Press. This is the same book we use for the Intro Quant methods course (GEO 3162c/6160). See the sections/chapters on Multiple Regression Analysis: Chapters 12-14 in 3rd edition.

Course Components (totaling 500 points overall)—

- 2 Lab Assignments @ 50 points each -- **100 points**
- Attendance -- **50 points**
- Term project/paper -- **350 points:**
  Paper/Write-up -- ***200 points*** + In-class Power-Point presentation -- ***150 points***

Student Performance Evaluation and Grades

Performance in the course (and a final course grade) will be determined by the total points earned **out of a possible 500 points**, and based on an overall percentage (see below). The breakdown is as follows:

91.0-100%	= A
90.0-90.9%	= A-
87.0-89.9%	= B+
80.0-86.9%	= B
78.0-79.9%	= B-
75.0-77.9%	= C+
65.0-74.9%	= C
60.0-64.9%	= C-
57.0-59.9%	= D+
50.0-56.9%	= D
45.0-49.9%	= D-
00.0-44.9%	= E

Grade Values for Conversion																
Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E	WF	I	NG	S-U
Grade Points	4.0	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.33	1.0	.67	0	0	0	0	0

Penalty for "late" labs (submitted after due dates, TBA) = **–10 points per 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. It is the student's responsibility to submit a lab write-up and output files to the instructor on a flash drive or CD (.pdf/.doc/.docx) or in hard-copy form by the assigned due date. All final term projects must be submitted on either a CD/flash drive or as hard-copy by the specified due date. No exceptions!

Attendance will be taken periodically to determine who is coming to class on a regular basis. Poor attendance will result in very low points for the attendance component. Note that class attendance component of this course is worth 50 points or 10% of your final grade…so be sure to attend regularly!

Note: The Instructor's Powerpoint slides will be made available in .pdf form on Canvas, provided that class attendance remains consistently good throughout the semester. Note that if attendance drops off, the Powerpoint presentations/lectures will no longer be available on-line.

Term Project: Applied Regression/Spatial Analysis

The term project must demonstrate a working knowledge of regression analysis in an application involving cross-section, spatial, and/or temporal data to address a specific research question (and to test designated hypotheses). The project must incorporate techniques or methods discussed in the course, extensions thereof, or other equivalent Intermediate-level techniques. Research topics must be pre-approved by the instructor (in advance), and students are responsible for acquiring, collecting, and managing their own data and database, as well as model construction, development and assessment. Students are also responsible for generating all related output and a final write-up in electronic form (or hardcopy should they prefer). E-copies of the term project can be submitted in any of the following forms: sans disk or flash drive or CD. Please make sure that your file is of a reasonable size (say less than 5 MB); especially for projects with high-resolution graphics. ***Students are responsible for analyzing their own data and results, and are required to write and submit a final term report, not to exceed 25 pages in length.***

Term Project Due Date (Submission of Final Term Paper/Report & related Power-point):
Tuesday, April 21st (by the end of the regularly scheduled class period).

If asked to do so…graduate students must be prepared to present their findings to the class in a short, approximately 20 minute, power-point presentation (time permitting… and this depends, of course, on the number of people enrolled this term). Note: No Late Projects will be accepted. All Projects and related materials must be submitted by Tuesday, April 21st, by the end of the scheduled class period. No late projects will be accepted. No exceptions.

Term Project Guidelines for Intermediate Quant

Overall the Term Project/Paper and Power-point summary (not to exceed 30 slides) is worth a total of **350 points** or **70%** of your final course grade. Your term project (paper/report, worth 200 points) and in-class .ppt/.pptx presentation, worth 150 points) should demonstrate a working knowledge of regression analysis or another Intermediate Level modeling/statistical/quantitative technique in an analysis involving spatial and/or temporal data; highlighting all pertinent findings in a formal and scientific manner. You will be graded based on the performance of your peers and my expectations based on your status as an undergraduate or graduate student. *Note that my expectations are higher for the graduate students enrolled in this course; especially doctoral students.*

Specifically, you are required to apply some form of "spatial analysis" or "regression-based" model to explain/predict or account for variation in a variable of interest. The project must include a write-up of the results, an overview of the model, technique, and methods used, and a detailed discussion of the findings and results. All relevant graphs, plots, charts, and statistical summary tables should be submitted along with a summary and write-up in a paper that is not to exceed 25 pages in length (submitted as a Word .doc/.docx files). Attach related computer-generated output as an appendix to your paper or as a .doc/.docx file (and note that these pages do not count as pages of text).
Note that an accompanying Power Point presentation must also be submitted. **Students are expected to present their work to the class during the last few weeks of the semester (25-30 minute presentation, followed by a brief Q&A session).** The Power-point summary of your analysis should be (a) limited to no more than 30 slides, and (b) submitted as a .ppt/pptx file on CD or flash drive along with your paper. **Note: Assignments and Finals Projects, and Powerpoints WILL NOT BE ACCEPTED via e-mail.**

The project write-up/paper/report must be typed, double-spaced, using a standard 12pt font (e.g., Times Roman or Helvetica) with standard 1" margins. It must include a detailed discussion of the topic and results, with relevant background information on your subject of interest, a literature review, a problem statement, and hypotheses. If submitting paper on CD or flash drive, please submit file as a Word .doc/.docx file. Thank you.

The term paper/project/report should have a cover/title page clearly showing the student's name, UF ID#, the course number (either GEO 4167c for undergraduates; GEO 6161 for graduate students), and the title of the project/paper. Note: the cover page does not count as a page of text. In addition to the cover/title page, the write-up should include the following items…

Overview of Project/Topic (i.e., Short Abstract)
Introduction and **Statement of the Problem**
Literature Review, Background Information ***section I***

Hypotheses (clearly defined)
Description of variables, model, and method(s) used
Theoretical justification of the Model/Analysis
Description of the Data used in the analysis
Summary table(s) highlighting the pertinent results ***II***

Interpretation and Summary of Results
Discussion of Relevant Findings
Conclusions
Implications and Directions for Future Research ***III***

Statistical Appendix (computer-generated output or other supporting material ... including Programming Code
Literature cited page(s) **/ Bibliography / Reference**s ***IV***

Note *that* ***section IV*** *materials do not count as pages of text.*

Term Papers/Projects/Final Reports, Power-point summaries, and Lab write-ups WILL NOT be accepted via e-mail. Regarding the term paper/project… again, the cover or title page, statistical appendix, and bibliography do not count as official pages of text. The overall length of text and discussion should not exceed 25 pages in length. Note that you will be graded on content, quality, and effort! The paper should be presented in a format that is consistent with a paper submitted to a professional journal for peer review.

If you plan to submit your project/paper in hardcopy form, the write-up must be page-numbered and the pages 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. Failure to properly staple or bind your pages together will result in the loss of 50 points. Note: Failure to turn in a final term project by the due date and time, as specified in this syllabus, will result in a grade of E for the course…and there are no exceptions. In short, no incompletes will be given out this term for any reason.

A note of the use of statistical software

Students are encouraged to use a statistical software program to assist them in their computation and estimation of various statistics and models. **Note, however, that this is not a course in how to use a software package, so students are on their own when it comes to learning and using statistical software.** I'd suggest familiarizing yourself with any of the following packages: **SPSS**, **NCSS**, **SAS**, ***MiniTab***, **SYSTAT**, **LIMDEP**, or **STATA**. Student versions of these software packages are available at discount rates… so shop around. You should seriously consider learning **SPSS or NCSS (**or another stats package) as statistical software is widely used in social and environmental science research…. especially if you are planning to engage in graduate-level research. For those of you who are unfamiliar with **SPSS**, there is a great book to help get you started. It is entitled: "***How to Use SPSS***", by Pyrczak publishing (7^{th} edition, 2008). This book is available at Amazon.com.

Note that **NCSS** – **Number Crunching Statistical Software** – is one of the better all-around statistical packages for Regression Analysis, in my opinion. It has been one of my go-to packages for some time now. **LIMDEP and SAS** are also very good for students wishing to go the advanced hard-core Econometric modeling or the Experimental Data Analysis routes (respectively)… but they do require learning a language and the various command codes as there are many intricacies and nuances associated with the procedures offered.

For those of you wishing to concentrate specifically on spatial data analysis and Geographic Information Systems (**GIS**) applications, and/or ***Geographically Weighted Regression (GWR)***, the **Spatial Analyst** toolkit in **ArcGIS** will undoubtedly serve you well. In addition, **GEODA** is a fairly user-friendly software/freeware program that can be used for applied spatial regression and/or spatial econometric modeling. For those of you programming in the **language R**, please attach relevant code with your final write-up (in a technical appendix).

A Note on Courtesy-- Please refrain from engaging in the following activities while the class is in session: texting, tweeting, cell-phone conversations, checking voice-mails, social networking, on-line surfing, website browsing, checking your e-mail, sending Instagrams, Tweets, Facebooking, Pinterest posts, etc. Do the social media thing on your own time! Moreover, I DO NOT tolerate students starring into their laptops and surfing the web while I am lecturing. In addition, talking or conversing with other students while the instructor is speaking and presenting lecture material is rude and unacceptable.

Term Project Due Date (Submission of Final Term Paper/Report & Related Powerpoint): Tuesday, April 21st, 2020 by the end of the scheduled class period. No exceptions!

Remaining enrolled after the first week of classes is an acknowledgment that you as a student agree with the terms and conditions outlined in this syllabus (as posted).

Good Luck and Good Journey!