

Geography 306  
**Introduction to Quantitative Methods for the Geographic and Environmental Sciences**

SYLLABUS

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**Course Information**

Call Number: 36498/36499  
Credit Hours: 3  
Lecture: TuTh 11:00-11:50 Am, LEF 1124  
Lab: F 9 -11 am, 11- 1 pm LEF 1138 (Geography Open Lab)  
Website: <http://elms.umd.edu>

**Instructor Information**

Instructor: Dr. In-Young Yeo  
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Office Hours: TuTh 9:30-10:30 or by appt

Teaching Assistant: Mr. Tom Fitzwater  
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Office hours: F 2 - 4 pm or by appt

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**Course Description**

This course is an introduction to quantitative methods for geographic and environmental sciences. Geographers, and other environmental and social scientists use quantitative methods such as statistics, to measure, describe, and make estimates about variables across the landscape for a variety of reasons, such as developing and testing hypotheses or to support decision making. Increasingly large amounts of spatial data are being generated and used by all levels of government as well as by other private and public institutions. Thus, developing solid skills in quantitative analysis should be a priority for any student in these fields.

The class covers the fundamentals of statistical analysis including data display, data description and summary, statistical inference and significance tests, analysis of variance, correlation and regression. Concepts will be presented and developed through the use of real world data sets that cover both the natural environment as well as the social environment.

**Course Objectives**

The main goal of this class is to provide a foundation in the quantitative analysis of spatial and other data, with a particular emphasis on statistics. At the conclusion of this course, students should be able to:

- develop an understanding of important theoretical concepts in statistical analysis;
- gain experience in the application of statistics to spatial and other data using specific statistical software.

**Who Should Take this Class?**

This class is appropriate for anyone majoring in the geographic (both physical and human and social) and environmental sciences. Students whose focus is on other aspects of spatial data handling and analysis, such as those in GIS and remote sensing will find it especially useful. The course also provides a good introduction for graduate students wishing to pursue more advanced course work in spatial analysis.

**Class Organization**

Class time will be devoted to lectures and computational labs. Lecture will cover theoretical material and applications, and lab hour will be devoted to solve additional problem sets and learn the practical mechanics of using our software. If you own a laptop, please consider bringing it to lab class. Do not miss the lab! It is *mandatory*.

## Readings

The required texts for this class is:

McGrew, J. Chapman and Charles B. Monroe. (2000). *An Introduction to Statistical Problem Solving in Geography*, Boston: McGraw Hill. ISBN: 0-697-22971-8.

A recommended optional text is:

Verzani, John. (2005) *Using R for Introductory Statistics*. Chapman & Hall/CRC Press. ISBN: 1-58488-4509

This is mostly a reference book to help you in using R.

*An Introduction to R*, available for free as a pdf from <http://www.r-project.org/>

There are a number of introductory statistics web sites that are very good and may help you considerably in understanding statistics, by providing different perspectives. Three that are recommended are below:

*Statistics at Square 1:*

<http://www.bmj.com/statsbk/>

*Electronic Statistics Textbook:*

<http://www.statsoft.com/textbook/stathome.html>

Simple R: Using R for Introductory Statistics

<http://www.math.csi.cuny.edu/Statistics/R/simpleR/index.html>

Further readings, if any, will be announced in class or by e-mail.

## Software

The required software for this class is R. R is the open source, freeware version of Splus, one of the most powerful and versatile statistical packages, and is available for free download for use on PC, Mac, UNIX and Linux environments. The software is available in the Geography Open Lab on the PC machines. If you have a laptop or home computer, get this software and download it immediately. The R software and user manual, *An Introduction to R*, may be downloaded for free from: <http://www.r-project.org/>. All students are REQUIRED to have a UMD GLUE account, and they must have a UMD email address. We will frequently use email for communication in this class, as well as to distribute materials, and we will only use UMD email addresses. In addition all students must get access to the Geography Open Lab PC. If your current email address is not the one listed by the UMD Registrar, please update that address immediately. The instructors will ONLY mail to a UMD email address.

## Course Requirements and Evaluation/Grading Policy

Grades for this class will be based on the following:

- Assignments (35 %), lab problem sets/class participation (5 %), and lab practice exam (10 %)
- 3 midterms (50 %): *your best two midterms will be accounted for 50 % of the final grade.*

Attendance at all lectures and labs is mandatory. All work turned in must be *the student's own*. Students are encouraged to work together, but students must do their own analysis and provide their own write up.

*Please note well that this is a **demanding** class that requires considerable time to learn the statistical concepts, the software, and the problem sets. You can expect to make the following time commitment on average: 2 hours of lecture per week, 2 hours of lab per week, and 5 hours of homework and/or reading each week outside the class.*

## Make-up and Late Assignment Policies

*No late assignments will be accepted* without prior arrangement. Make-up exams will be given only for University approved excused absences. Students claiming an excused absence must apply in writing *prior to class time*, and furnish documentary support *immediately upon your return to class* for any

assertion that the absence qualifies as an excused absence. The support should explicitly indicate the dates or times the student was incapacitated due to illness. Students will not be allowed to turn in missed assignments or make up quizzes, tests, papers, etc. if they have not provided this documentation. Documentation not presented in a timely manner will not be accepted. In addition, if it is found that students have falsified the documentation provided, I will refer students to the University's Student Conduct Office. It is also the student's responsibility to inform the instructor of any intended absences from exams for religious observances *in advance*. Notice should be provided as soon as possible.

### **Academic Misconduct and Disruptive Behavior**

The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity for all undergraduate and graduate students. All students are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit <http://www.shc.umd.edu>.

Within our class, students may work together on problem sets, however, each student absolutely must turn in their own work, from their own computer, and any discussion must be theirs alone, and not attributable to another person or group. Students must list everyone they collaborated with on each problem. Students may not use any textual discussion, calculations or programs from any other student or group of students.

Students are expected to treat each other with respect. Disruptive behavior of any kind will not be tolerated. Students who are unable to show civility with one another, the teaching assistants, or myself will be subject to being referred to the Office of Student Conduct or to Campus Police. You are expected to adhere to the Code of Student Conduct. *To assure a respectful learning environment, you may be recorded during lecture, lab, and office visits.*

### **Disability Statement**

Any student who feels he or she may need an accommodation based on the impact of a disability should contact the instructor privately to discuss his or her specific needs. Please contact the Office of Disability Support Services (<http://www.counseling.umd.edu/DSS/>) at 301.314.7682 in Counseling Center, 0126 Shoemaker Building to coordinate reasonable accommodations in case of documented disabilities.

I will make every effort to accommodate students who are registered with the Disability Support Services (DSS) Office and who provide me with a University of Maryland DSS Accommodation form which has been updated for the Fall 2008 semester. This form must be presented to me no later than October 1, 2008. I am not able to accommodate students who are not registered with DSS or who do not provide me with documentation which has been reviewed by DSS after October 1, 2008.

## GEOG 306 Course Schedule

Dates	Lecture Topics	Reading Assignment
<b>Basic Statistical Concepts and Descriptors</b>		
Wk of 1/26	Course Overview Introduction to Statistics and Computing	Chapter 1 (Chapman) Chapter 1-3 (Verzani)
Wk of 2/2	Geographic Data: characteristics and preparations	Chapter 2 Chapter 1-3 (Verzani)
<b>Basics of Statistical Problem Solving</b>		
Wk of 2/9	Descriptive Statistics	Chapter 3 (Chapman) Chapter 1-3 (Verzani)
Wk of 2/16	Probability	Chapter 5 (Chapman) Chapter 5 (Verzani)
Wk of 2/23	Probability / Review <b>Midterm I – Feb 27</b>	Chapter 5 (Chapman) Chapter 5 (Verzani)
Wk of 3/2	Data Sampling	Chapter 6 (Chapman) Chapter 6 (Verzani)
Wk of 3/9	Estimation in Sampling	Chapter 7 (Chapman) Chapter 6 (Verzani)
Wk of 3/16	Spring Recess – Enjoy your spring break!	
<b>Inferential Problem Solving</b>		
Wk of 3/23	Elements of Inferential Statistics <i>(AAG Week – the instructor away)</i>	Chapter 8 (Chapman) Chapter 8 (Verzani)
Wk of 3/30	Analysis of Variance: Two-Sample Tests	Chapter 9 (Chapman) Chapter 11 (Verzani)
Wk of 4/6	Analysis of Variance: Multiple Sample Tests <b>Midterm II –April 10</b>	Chapter 10 (Chapman) Chapter 11 (Verzani)
Wk of 4/13	Goodness of Fit Tests	Chapter 11 (Chapman) Chapter 9 (Verzani)
<b>Relationships Between Variables</b>		
Wk of 4/20	Correlation	Chapter 13 (Chapman)
Wk of 4/27	Regression	Chapter 14 (Chapman) Chapter 10 (Verzani)
Wk of 5/4	Regression (Cont'd) / Review <b>Midterm III –May 8</b>	Chapter 13 (Chapman)
Wk of 5/11	<b>Lab Exam – 8:00-10:00 am, May 14</b>	

\* This is a tentative schedule, which is subject to revision by the instructor.