

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

SYLLABUS

Course Information

Call Number: 35273

Credit Hours: 3

Lecture: TuTh 11:00 am-11:50pm, LEF 1124

Lab: F 9-11 am, LEF 1136/1138 (Geography Open Lab)

Website: <http://elms.umd.edu>

Instructor Information

Instructor: Dr. In-Young Yeo

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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. There are no prerequisites for the class.

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 the practical mechanics of using our software to answer

specific problems. 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 for you 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 your understanding by providing a different perspective. Three that are recommended are below (but there are many, many others, for example see the following web site for a list of online materials:

<http://www.geog.ubc.ca/vgd/statistics/tutorials/tutorials.html>

Statistics at Square 1:

<http://bmj.bmjournals.com/statsbk/index.shtml>

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 (5 %), and lab practice exam (10 %)
- Midterm (20 %), final exam (20 %), and quizzes (10 %)

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.*

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 from an exam must apply in writing and furnish documentary support (such as from a health care professional who treated the student) 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. 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

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.

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.

GEOG 306 Course Schedule

Dates	Lecture Topics	Reading Assignment
Basic Statistical Concepts and Descriptors		
Wk of 1/28	Course Overview Introduction to Statistics and Computing	Chapter 1
Wk of 2/4	Geographic Data: characteristics and preparations	Chapter 2
Basics of Statistical Problem Solving		
Wk of 2/11	Descriptive Statistics	Chapter 3
Wk of 2/18	Probability Quiz	Chapter 5
Wk of 2/25	Data Sampling	Chapter 6
Wk of 3/3	Estimation in Sampling	Chapter 7
Wk of 3/10	Review MIDTERM – March 13	
Wk of 3/17	Spring Recess – Enjoy your spring break!	
Inferential Problem Solving		
Wk of 3/24	Elements of Inferential Statistics	Chapter 8
Wk of 3/31	Analysis of Variance: Two-Sample Tests	Chapter 9
Wk of 4/7	Analysis of Variance: Multiple Sample Tests	Chapter 10
Wk of 4/14	Goodness of Fit Tests (AAG meeting**) Quiz	Chapter 11
Relationships Between Variables		
Wk of 4/21	Correlation	Chapter 13
Wk of 4/28	Regression	Chapter 14
Wk of 5/5	Regression (Cont'd) Review	Chapter 14
Wk of 5/12	Final Exam – May 12 Lab Exam -- 8:00-10:00 am, May 15	

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