

**Course Information for
22S:167 “Environmental and Spatial Statistics”
Spring 2007**

Instructor

Dale Zimmerman, 233 Schaeffer Hall, Office phone 5-0818, Home phone 351-0520,
E-mail dzimmer@stat.uiowa.edu, webpage <http://www.stat.uiowa.edu/~dzimmer/>

Office Hours

4:00 – 5:00 pm Monday and Wednesday, 1:00 – 2:00 pm Tuesday and Thursday, or by appointment

Department Information

Department of Statistics and Actuarial Science, 241 Schaeffer Hall, Phone 335-2082

Department Executive Officer

Professor Luke Tierney, 241 SH, Phone 335-0712, E-mail luke-tierney@uiowa.edu

Textbook

The required textbooks for this course are:

1. *S-Plus SpatialStats User’s Manual for Windows and Unix*, by Kaluzny, Vega, Cardoso, and Sheely (Springer Verlag).
2. *Statistical Methods for Spatial Data Analysis*, by Schabenberger and Gotway (Chapman & Hall/CRC).

Lecture notes will be provided on Professor Zimmerman’s webpage to supplement these books.

Course Prerequisites

22S:152 (or equivalent) and 22S:154 (or equivalent).

Course Objectives

To learn some of the most important methods for explicitly accounting for time and space in the statistical analysis of environmental data. In addition to learning the methods, it is our goal to learn when and why they are appropriate, what the underlying assumptions are, and how to implement the methods using various statistical packages/languages.

Major Topics Covered

- Exploratory temporal and spatial data analysis
- Temporal trend detection and estimation
- Geostatistics: Semivariogram estimation and Kriging

- Spatial regression
- Environmental monitoring network design
- Lattice (areal) data analysis, including disease mapping
- Spatial point pattern analysis
- Modeling spatio-temporal data
- Methods for sampling environmental populations (time permitting)

Computing

Substantial computing will be necessary to complete many homework assignments and the final project. We will be using a variety of software including SAS, S+SpatialStats, and R; some instructions on their use will be provided in class.

Homework

Written homework assignments are an essential component of the course. Assignments will be given every week or week-and-a-half. Assignments must be turned in at the beginning of class on the day they are due. Unless prior arrangements are made, homework turned in late will receive a score no higher than 50%. You may work on homework problems together, provided that no outright plagiarism occurs.

Some assignments will involve the analysis of data using a computer. Any computer output you wish to include with your homework should be fully labeled and annotated, and should be integrated with other parts of the homework by cutting and pasting (electronically or otherwise).

Attendance

Attendance at lectures and participation in discussions are expected. Coming late to class, leaving early, or failing to attend class often will lower your grade.

Take-home Midterm Exams

Two take-home midterms exams will be given. The first will be handed out in late February and will be due one week later. The second will be handed out in mid-April and will be due one week later. Both exams will involve more extensive data analysis and/or simulation than homework assignments do.

Final Project

In lieu of a final exam, each student or pair of students (your choice) will prepare and deliver a short (20-25 minute) presentation on a spatial statistics topic of his or her own choosing (but one which has not been covered in class). Presentations will be given during the last two weeks of the regular semester. To accompany this oral presentation, students will prepare and hand out to classmates (and the instructor) their lecture notes on this topic, similar in format to the instructor's lecture notes. These presentations can be based on papers in the spatial statistics literature or on original research, and they should include a worked example with computer code (if appropriate). Professor Zimmerman can provide ideas for possible topics.

Grading

- Homework and Attendance, 40%
- Take-home Midterm Exams, 40% (20% each)
- Final Project, 20%

Plus-minus grading will be used.

Students with Disabilities:

I would like to hear from anyone who has a disability that may require some modification of seating, testing, or other class requirements so that appropriate arrangements can be made. Please see me after class or during office hours very soon to discuss this.

Course Policies

Course policies are governed by the College of Liberal Arts and Sciences. University policies regarding Student Rights and responsibilities can be found at

http://www.clas.uiowa.edu/students/academic_handbook/