

Statistics/Mathematics 309 —Introduction to Mathematical Statistics I
FALL 2009

Instructor Information

Bret Larget
MSC (Medical Sciences Center) 1250A
<http://www.stat.wisc.edu/~larget/>
brlarget@wisc.edu
262-7979

Office Hours:

Tuesday, 2:00–4:00, Wednesday, 2:00 - 3:30,
and by appointment.

Course Information

Lecture:

Mon./Wed./Fri. 9:55–10:45, Social Science 6203

Discussion:

311: Monday, 1:20–2:10, Sterling 1327

312: Monday, 12:05–12:55, Chem 2381

313: Tuesday, 8:25–9:15, Social Science 4314

Prerequisites:

Mathematics 234 (Multivariate Calculus)

Course Materials

Required textbook: *Probability and Statistics: The Science of Uncertainty*, by Evans and Rosenthal.

Course websites: See <http://www.stat.wisc.edu/courses/st309-larget/> for the course syllabus, homework assignments, exam solutions, and other course materials.

See <https://learnuw.wisc.edu/> for the gradebook.

The course will cover in part Chapters 1–4 and 11 of the textbook. Statistics 310 will cover much of the remainder of the textbook.

Course Objective

The primary objective of Statistics 309 is to provide students with a solid foundation in probability theory at an undergraduate majors level. From this foundation, students will have the background to continue study in mathematical statistics, to explore more advanced measure-theoretic probability courses, and to understand the basic probability models used across a wide variety of fields.

I expect that most students will develop a fondness for probability, a desire to work hard to understand everything in the course, and the motivation to continue to learn more after the course has ended. Most students will discover that learning about probability is just plain fun.

Computing

While much of the course will require application of large variety of mathematical techniques using paper, pencil (or pen), and deep thought, some assignments will require use of the computer to conduct simulations to reinforce probabilistic ideas and explore questions difficult to answer analytically, to make accurate numerical calculations, and to visualize probability distributions.

I have selected R to teach in this course for many reasons. First and foremost, it is the first choice of most academic statisticians and is the most widely used package in graduate programs in statistics. R offers superior graphical capabilities, is based on a model of interactive data analysis, is flexible and extensible, and is extremely powerful. R is also free, works on all of the major computing platforms, including Windows, Macintosh, and Linux. There is a large and vibrant R community and an increasing number of R books and on-line materials aimed at users of different skill levels and background. To become proficient in R is to attain a useful skill for life that can be applied long after the course ends. No other software choice offers the same suite of positive attributes.

Assignments

Work on homework assignments outside of class is likely to be the most effective manner in which you will learn and master course content. Homework assignments are due each week on Wednesday, in your TA's mailbox, by 5:00 pm. Assignments will be returned the following week in discussion section. Homework assignments should be well organized and reasonably neat. You must show your work to receive credit. Late homework assignments will be penalized for each day they are late unless extenuating circumstances exist. If possible, prior arrangements should be made with me in such cases. My judgment on the penalty for late work and the appropriateness of excuses for late work is final.

Grading

The grading system I use in this course is unusual, so read carefully! Your grade will be determined by exams (80%) and homework (20%) on a scale from 0 to 250 points. There are eight exams worth 25 points each and fourteen homework assignments worth 4 points each (up to a maximum of 50 points, so you can lose 6 points without penalty).

The exam score can be improved during the final exam period.

I will assign course grades according to this scale:

| Points | Grade |
|---------|-------|
| 230–250 | A |
| 210–229 | AB |
| 190–209 | B |
| 170–189 | BC |
| 150–169 | C |
| 125–149 | D |
| 0–124 | F |

It is possible for a student who does well on all of the exams and on the homework to earn an A prior to the final exam period.

Exams:

The eight short exams (25 points each) will be given on each of four days during lecture (see course web site for dates). Each exam is typically a single extended problem with several parts.

I will not give make-up exams during the semester — if you miss an exam, you will need to take a replacement exam during the final exam time. Specifically, I will not give make-up exams during the semester for attending family functions, extending breaks, sleeping in, missing a bus, or illness. If you miss an exam, you receive a temporary zero, but can replace this score with a replacement exam during the final exam period. *At my sole discretion*, I may permit alternative exam times for students who give me prior notice of a university-related conflict.

Exams will cover material in book chapters with this frequency: Chapter 1 (2), Chapter 2 (2), Chapter 3 (2), Chapter 4 (1), Chapter 11 (1).

During the final exam period time, there will be eight replacement exams available from the same chapters as above. Since each exam is targeted to require about 20–25 minutes, you should only count on having sufficient time for 4–5 exams although you are welcome to attempt as many exams as you wish. Scores on replacement exams can be used to replace lower scores on exams taken during the semester *from the same chapter*. In addition, *there is no penalty for scoring lower on a replacement exam than you did on the corresponding exam during the semester*. Your final exam score for the semester is the total of the best two exams from Chapters 1 through 3, the best single exam from Chapters 4 and 11.

Homework:

There will be 14 homework assignments worth 4 points each consisting of exercises from the textbook and exercises from other sources including computing problems. The maximum score you can receive from homework is 50 points, which allows you to miss up to 6 points without affecting your semester grade.

Your homework solutions should be organized and neat with solutions in order the order problems were assigned. Each problem solution should include a brief description of the problem (that may be paraphrased from the actual problem) as well as your work. *If your assignment is not neatly organized with problems in order and is not clearly legible, making it easy for the grader to follow the approach you take for each solution, your grade for the assignment will be lowered one point.*

Homework assignments are due on Wednesdays at 5pm in the TA's mail box. Assignments turned in by 5pm on Thursday can receive a maximum of 2 points. Assignments turned in by 5pm on Friday can receive a maximum of 1 point. Assignments more than two days late receive no credit.

For well-organized and neat assignments, this is the grading rubric.

| Points | Characteristics |
|--------|--|
| 4 | Almost all problems are essentially correct with no major conceptual flaws. There may be some minor errors or calculation mistakes. |
| 3 | At least two problems are incomplete or contain a major conceptual flaw, but most problems are essentially correct. There may also be some minor errors or calculation mistakes. |
| 2 | More than half the problems are incomplete or contain a major conceptual flaw, but there is evidence that the student made a serious attempt to solve most problems. The student gets some parts of some problems correct. |
| 1 | The assignment shows little progress toward a correct solution on any problem, but there is evidence that some serious effort was put forth on at least one problem. |
| 0 | The assignment is not turned in or contains no evidence that the student put forth serious effort on any problem. |

Honors

Student taking the course for honors will carry out a project during the semester of especially challenging problems. The assignment will include computer work.

Discussion Sections

Assuming there is sufficient space, you may attend any discussion section without changing your registration. Time in discussion section will typically be used to solve problems similar to those on assignments, to ask questions, and to review past assignments. In some discussion sections there will be an opportunity to take and discuss a practice exam. Attendance is strongly encouraged, but not required.

Academic Honesty

You are permitted and, in fact, *encouraged* to talk to other students, your teaching assistant, or me about homework. Your TA or I may give you clues or discuss similar problems without doing your homework for you. You may look through books or Web pages for solutions to problems. However, you may not present other people's work as your own. Make sure to include with any submitted solutions to problems references to any sources of direct assistance. If you work with other students solving problems, make sure that you write up your own solution independently. It is not acceptable for one student to write a solution for another student to copy.

You must work independently during exams. You may not share calculators, pass notes, or use a laptop computer during the exams.

Syllabus

The course web page will include a tentative schedule addressing which topics will be covered during which lectures. As this is my first time teaching this course and the scope of topics differs from the past, this schedule should be treated as an educated guess that is subject to change.

I expect to spend approximately the following number of lectures on each chapter:

Chapter 1 (8 lectures), Chapter 2 (13 lectures), Chapter 3 (8 lectures), Chapter 4 (6 lectures), and Chapter 11 (4 lectures).