Stat 61
Probability and Mathematical Statistics I
Fall 2009

Place: Science Center L26
Time: Tuesday and Thursday, 9:55am–11:10am (Sec. 1) or 11:20am-12:35pm (Sec. 2)
Students are expected to attend class regularly, arrive on time, and participate in class discussions.

Instructor: Kevin Ross, kross1@swarthmore.edu, Science Center 151, 610-328-7898
Office hours: Monday 10:00am–noon, Tuesday 2:00pm–4:00pm, Wednesday 2:00pm–4:00pm
Additional office hours by appointment

Course website: http://blackboard.swarthmore.edu
Please check the website regularly for announcements and other Course Documents (e.g. homework assignments, practice exams, etc). If you are enrolled in the course, you should have access to the website; contact the ITS Help Desk (help@swarthmore.edu or x4357) if you have problems.

Course Goals: This course introduces the mathematical theory of probability, including density functions and distribution functions, joint and marginal distributions, conditional probability, and expected value and variance. It then develops the theory of statistics, including parameter estimation and hypothesis testing. The emphasis is on proving results in mathematical statistics rather than on applying statistical methods. Students needing to learn applied statistics and data analysis should consider Stat 11 or Stat 31 in addition to or instead of this course.

By taking Stat 61, students will:

- Receive an introduction to the theory of probability, both discrete and continuous, including some combinatorics, and a variety of useful distributions and their properties.
- Solve mathematical problems using probability.
- Develop a basic understanding of the major areas of inferential statistics, including estimation, hypothesis testing, and regression.
- Learn how probability provides a rigorous mathematical foundation for common statistical procedures.
- Solve basic computational problems involving estimation, hypothesis testing, and regression.
- Develop a solid foundation for further study in Statistics (e.g. Stat 111, Spring 2010) or Probability (e.g. Math 105, Spring 2011)

Prerequisites: The prerequisite for Stat 61 is multivariable calculus at the level Math 23, 33, or 34. If you do not know calculus reasonably well, you may have a hard time following the course material. In particular, you will need to be comfortable with limits, infinite series, differentiation, and integration. It is recommended that you do NOT take Stat 61 and Math 23/33/34 concurrently, since we will use some calculus topics in Stat 61 before they are covered in the Math classes. It will be assumed that all students have the prerequisite background; it is the responsibility of each student to make up any deficit.

To give you an idea of what you need to know, try the calculus quiz posted on the website (this is not a homework; do not turn this in). The quiz is by no means an exhaustive review of the prerequisite material. You do not have to know all the answers. However, if you have trouble with most of the questions then you should probably not take Stat 61; but see the Instructor before dropping the course.

Required Text: Rice, John. *Mathematical Statistics and Data Analysis*, 3rd edition.
Reading assignments from the Rice text will be announced after each class; be sure to read the assigned sections before the next class. We will cover Chapters 1 and 2 and parts of Chapters 3–14, skipping over many of the details. Stat 111 will use the same text and go into more detail on many of these same topics, as well as introduce you to some more advanced material from other sources.

Other References: There are many texts covering probability and/or mathematical statistics. Listed below are just a few at the level of this course. The first three cover probability only (in more depth than in Rice); the rest are similar to the Rice text.

Grinstead and Snell, *Introduction to Probability* (available online for free download)
Pitman, *Probability*
Ross, *A First Course in Probability*

Degroot and Schervish, *Probability and Statistics*
Devore and Berk, *Modern Mathematical Statistics with Applications*
Larsen and Marx, *Introduction to Mathematical Statistics and Its Applications*

Homework: Weekly homework problems will be posted on the course webpage. **Homework is due by noon on Wednesday.** Hand in your papers in the Stat 61 mailboxes outside of Science Center 135 (there is a mailbox for each section). There will be 10 assignments in total; see the due dates below. No late homework will be accepted, with the following exception. Each student is allowed to take an extension on one homework assignment, in which case the assignment will be due by 4:00pm on Friday. To use your one late pass, simply email the instructor to let him know (no excuse or justification is necessary).

Collaboration is allowed and encouraged in solving the problems, but each student must hand in his or her own independently written solutions. Show all work supporting your answers; correct answers without supporting work will not receive credit. **You are strongly encouraged to attend office hours or the Stat Clinic if you have questions about the homework assignments (or about the course in general).** The Stat Clinic will be held every Monday night, 7:00pm–10:00pm, in Science Center 158; see the handout for more details.

Computing: Some assignments may make use of the statistical programs JMP (available on the Swarthmore Data & Software server) or R (available for free download at http://www.r-project.org/). Detailed instructions will accompany these assignments.

Grading & Exam Schedule: The course grade will be determined by scores on homework, two midterms, and a final exam (see the percentages below). Midterm 1 will cover material through Sept 24 (roughly chapters 1, 2, 3, and Sections 4.1–4.2 of Rice). Midterm 2 will cover material from Sept 29 through Nov 5 (roughly Sections 4.3–9.4 of Rice). The final exam will be cumulative.

Homework	25%	Due by noon on Sept 9, 16, 23, 30; Oct 21, 28; Nov 4, 11, 25; Dec 2
Midterm 1	20%	Thursday, October 8, in class
Midterm 2	20%	Thursday, November 19, in class
Final	35%	Date/time announced by October 1; exam period is Dec 11–Dec 19

No makeup exams will be given unless a student is unable to take the exam due to serious illness, religious holidays, family emergencies, or participation in athletic contests. Contact the instructor as soon as possible if you anticipate difficulty in taking any examination at the scheduled time.