STAT 425    Probability Theory    Fall 2011
(Revised Syllabus)

Instructor: Allan Rossman
Class Meetings: MTuWF 11:10-12:00 in room 186-C303
Office: 25-102, 805-756-2861
Email: arossman@calpoly.edu (best way to contact me)
Office Hours: MTu 1-2, WTh 2-3, F 8:30-9:30, and by appointment and by chance
Course Webpage: http://statweb.calpoly.edu/rossman/stat425/

Overview: Much of statistics builds on a foundation of probability theory. Probability is the
mathematical study of randomness and uncertainty. It can be considered a great intellectual
achievement, because while a random process is unpredictable in the short term, we can make
very accurate predictions about the pattern of variation from that process in the long term. We
will pay particular attention to those aspects of probability theory that have application to
statistics.

Goals: By the conclusion of the course, I hope that you have improved your ability to:
- understand probability concepts
- derive and prove probability results
- apply probability methods to solve problems
- use computer software to investigate random phenomena, and
- communicate your knowledge of probability effectively

Class Policies: I expect class meetings to be fairly informal. During a typical class period I will
present new material, but I will ask you to answer questions and solve problems. I also strongly
encourage you to ask questions as they occur to you during class.

Please come prepared to participate in class. By this I primarily mean two things:
- Please read relevant sections of the text before coming to class. Read carefully, and
come to class with questions on what you do not understand.
- Please be willing (or, even better, eager!) to ask questions and contribute answers and
work on problems (when I ask you to) during class.

I also expect you to devote 8-12 hours per week, outside of class time, to your work for this
course. I anticipate that this work will include:
- reading the textbook
- reviewing and organizing your class notes
- formulating questions to ask in class and office hours
- working on take-home quizzes
- working on investigation assignments
- working on textbook exercises
- studying for exams

Naturally, you can and should expect me to prepare for class and to devote substantial time to the
course outside of class as well.
Grading Policies: Your course grade will be determined by the following components, with relative weights as indicated:

- assignments (30%)
- two midterm exams (20% each)
- comprehensive final exam (30%)

Assignments: I will make regular homework assignments of 2-3 questions with multiple parts, typically due after 48 hours. You may work with one partner on these investigations, handing in one report with both of your names, provided that you both contribute substantially to the work. Word-processed reports of investigations are preferred to hand-written ones, and computer output should be integrated into your report. These assignments are due at the beginning of class on the indicated day. You may drop your two lowest scores. Late assignments will not be accepted except for very compelling circumstances.

The purposes of these quizzes, assignments, and exercises are:

- to give you the practice with proof and problem-solving techniques in order to learn, understand, and apply the course material,
- to provide you with feedback regarding your understanding of the material,
- to further your discovery and exploration of course material, and
- to prepare you for the kinds of questions that will be on the exams.

I will also encourage you to work on selected exercises from the text that are not to be turned in. Be aware that answers to odd-numbered exercises appear in the back of the book.

Exams: Exact dates for the exams will be announced at least one week in advance. You will received detailed guidelines and advice at that time. The exams will be open-book and open-notes. You may make up an exam only with a written medical excuse.

Advice: With apologies to David Letterman, I offer the following "Top Ten" suggestions to improve your learning in this course:

- Come to class.
- Participate in class.
- Invest time outside of class.
- Read carefully.
- Ask questions.
- Use office hours.
- Help each other.
- Write clearly, including good notation.
- Take pride in your work.
- Think!

A common theme emerges from this list: You are responsible for your own learning. As your instructor, I view my role as providing you with contexts and opportunities which facilitate the learning process. Please call on me to help you with this learning in whatever ways I can.
**Tentative Schedule:** The following is always subject to change but should give you a sense for what topics we will cover and when:

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Topics</th>
<th>Sections from Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sept 19-23</td>
<td>Set Theory, Basics of Probability, Counting Methods</td>
<td>1.3, 1.4, 1.5, 1.6, 1.7</td>
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<td>2</td>
<td>Sept 26-30</td>
<td>Combinatorial Methods</td>
<td>1.8, 1.9, 1.10, 1.11</td>
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<td>3</td>
<td>Oct 3-7</td>
<td>Conditional Probability, Independence</td>
<td>2.1, 2.2</td>
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<td>4</td>
<td>Oct 10-14</td>
<td>Bayes' Theorem, <strong>Exam</strong></td>
<td>2.3</td>
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<td>5</td>
<td>Oct 17-21</td>
<td>Discrete and Continuous Random Variables,</td>
<td>3.1, 3.2</td>
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<td>6</td>
<td>Oct 24-28</td>
<td>Cumulative Distribution Functions, Bivariate Distributions</td>
<td>3.3, 3.4</td>
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<td>7</td>
<td>Oct 31-Nov 4</td>
<td>Marginal, Conditional, and Multivariate Distributions</td>
<td>3.5, 3.6, 3.7</td>
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<td>8</td>
<td>Nov 7-10</td>
<td>Functions of Random Variables, <strong>Exam</strong></td>
<td>3.8, 3.9</td>
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<td>9</td>
<td>Nov 14-18</td>
<td>Expectation, Properties, Variance</td>
<td>4.1, 4.2, 4.3</td>
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<td>10</td>
<td>Nov 21-22</td>
<td>Moments, Measures of Center</td>
<td>4.4, 4.5</td>
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<td>11</td>
<td>Nov 28-Dec 2</td>
<td>Covariance, Conditional Expectation</td>
<td>4.6, 4.7</td>
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<td>Wed Dec 7, 10:10-1:00</td>
<td><strong>Final Exam</strong></td>
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