Instructor: Timo Seppäläinen  
office: 419 Van Vleck  
email: seppalai@math.wisc.edu  
office hours: MW 10-11, any other time by appointment

Class periods: MWF 1:20-2:10, Van Vleck B105

Textbook:  
A First Course in Probability by Sheldon Ross, 8th edition.  
Previous editions of the book cover the material also, but homework is assigned from the eighth edition.

Course homepage:  
http://www.math.wisc.edu/~seppalai/courses/431/431home.html  
On the homepage you will find the homework assignments and the latest updates on scheduling and all other matters.

Course description:  
Math 431 is an introduction to probability theory, the part of mathematics that studies random phenomena. We model simple random experiments mathematically and learn techniques for studying these models. Topics covered include methods of counting (combinatorics), axioms of probability, random variables, the most important discrete and continuous probability distributions, expectations, moment generating functions, conditional probability and conditional expectations, multivariate distributions, Markov’s and Chebyshev’s inequalities, laws of large numbers, and the central limit theorem.

Probability theory is ubiquitous in natural science, social science and engineering, so this course can be valuable in conjunction with many different majors. 431 is not a course in statistics. Statistics is a discipline mainly concerned with analyzing and representing data. Probability theory forms the mathematical foundation of statistics, but the two disciplines are separate.

From a broad intellectual perspective, probability is one of the core subjects of mathematics with its own distinct style of reasoning. Among the other core areas would be analysis, algebra, geometry/topology, logic and computation.

Prerequisites:  
Calculus, including multivariable calculus, basic set theory, capacity to reason abstractly.

Grades:  
Course grades are determined by three inputs: homework and quizzes (10%), three in-class exams (3 × 20%), cumulative final exam (30%). These are grade lines that can be guaranteed in advance: a score in the indicated range guarantees at least the letter grade above it:

<table>
<thead>
<tr>
<th>Grade</th>
<th>A</th>
<th>AB</th>
<th>B</th>
<th>BC</th>
<th>C</th>
<th>D</th>
<th>F</th>
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<tr>
<td>% of total points</td>
<td>≥ 91</td>
<td>∈ [87, 91)</td>
<td>∈ [79, 87)</td>
<td>∈ [75, 79)</td>
<td>∈ [65, 75)</td>
<td>[55, 65)</td>
<td>&lt; 55</td>
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The actual final grade lines will be adjusted to reflect the performance of the class in relation to historical data.
Homework
Homework assignments, their due dates and instructions appear on the course homepage. Homework assignments are handed in at the beginning of the class period of the due date, or alternately by 3 PM in the instructor’s office or mailbox. Late homework will not be accepted. IMPORTANT: handing in plagiarized work, whether copied from a fellow student or off the web, is not acceptable. Credit in homework comes from your reasoning, so neatness and clarity of exposition are essential. Instead of writing up your solutions by hand, you are welcome to typeset them with LaTex if you prefer. Calculators cannot be used in quizzes and exams, but calculators are needed for some homework problems.

Quizzes
There will be a couple quizzes at the beginning of the semester to practice problem solving under a time limit before the first in-class exam. We can have more quizzes later in the semester if this seems useful for learning the material. Your input matters here.

In-class exams
Three in-class exams take place during class periods.
- Exam 1 on Chapters 1-3 Friday, February 11 (week 4).
- Exam 2 on Chapters 4-5 Wednesday, March 9 (week 8).
- Exam 3 on Chapters 6-7 Friday, April 22 (week 13).
No calculators, cell phones, or other gadgets will be permitted in exams and quizzes, only pencil and paper.

Final exam
The final exam covers the entire course. It is on Friday, May 13, 5:05-7:05 PM.

How to succeed in this course
A beginner usually finds probability theory very hard, even after success in past math courses. This is because probability is more than just a part of mathematics. It has its own logic which takes time and serious commitment to master.

Lecture time is not sufficient to cover everything, so read the book regularly, ideally both before and after a section has been covered in class. Think about the concepts often. Form a study group with classmates. Things get clearer when you talk about them with others. Homework problems alone do not guarantee sufficient practice, so be sure to work out lots of additional exercises.