MATH 4221: Stochastic Processes I Syllabus

Basics

Lectures: Tuesdays / Thursdays 9:35 - 10:55 am, Skiles 254
Instructor: Will Perkins, *perkins@math.gatech.edu*
Office Hours: Thursdays 11 am - 1pm, or by appointment
Course Webpage: *http://people.math.gatech.edu/˜wperkins3/4221/*
Course Discussion Page: *https://piazza.com/class#fall2013/math4221* Signup for the Piazza discussion page (required).

Course Material

The course is a second course in probability, covering techniques and theorems seen from the perspective of random walks, Markov Chains, and other discrete stochastic processes.

The required textbook for the course is *Probability and Random Processes*, 3rd ed. by Grimmett and Stirzaker. I will post lecture notes on the course webpage as well.

Grading

The grading scheme for the course is designed to align our goals for the course: to learn probability as thoroughly as possible. I will divide the course into 8 topics that I want you to master by the end of the semester. They are:

1. Basic Probability

2. Expectation and Variance

3. Conditional Probability

4. Law of Large Numbers and Convergence of Random Variables

5. Central Limit Theorem and Characteristic Functions

6. Simple Random Walk and Branching Processes

7. Martingales and Conditional Expectation

8. Markov Chains

Your grade will be determined by how many of the 10 topics you have mastered by the end of the course.

- 8: A

- 6-7: B

- 4-5: C

- 2-3: D

- 0-1: F

Mastering a topic means understanding it from all angles. You should understand the definitions, theorems, and examples we've discussed in class. You should be able to apply the theorems and methods to problems you've never seen before (and not just be able to do problems of the same type you've seen). Understanding a theorem means understanding how it can be used (and knowing some specific examples); understanding why each of its conditions is necessary (and knowing counterexamples); understand why its conclusion cannot be made more strong.

There will be several ways to demonstrate that you've mastered a topic:

- An oral quiz.

- Two midterm exams, with four topics each.

- A final exam with all 8 topics.

Once you've showed that you've learned a topic, you're done with it for the whole semester. If you've already mastered all topics on a test, you don't need to take the test.

Homework   I will assign homework every two weeks, and post it on Piazza. I encourage you to work on the problems alone at first, then check answers with each other, and explain the parts you don't understand to each other. You can use the piazza discussion site to do this. I will not collect or grade the homework, but I expect you to finish and understand all of the problems. You will need to understand all the solutions to pass the oral quizzes.

Oral Quizzes   Please read the rules carefully. I've designed them to encourage you to keep up with the course, while still allowing you to re-learn material you might have missed on a previous quiz or test.

- You may take up to 3 oral quizzes: one before September 13, one between Sep. 23 and October 18, and one after October 21 but before November 26.

- You may choose as many topics as you want to be tested on.

- You can retake topics.

- Each topic will be graded separately. You either pass (shown mastery) or not.

- The first question for each topic will be to give the answer to one of the homework problems on the topic. You must get this right to pass the topic.

- The other questions will be questions you have not seen before, but I will provide sample questions on the website.

- You should know all the definitions and theorems listed in the topic descriptions.

Tests and Final Exam

- Test #1: October 8, Topics 1-4

- Test #2: November 19, Topics 5-8

- Final Exam: All topics

- Like the oral quizzes, the tests will be graded topic by topic, "mastered" or "not mastered".