Math 671 — Advanced Probability — Fall 2013 — Syllabus

1 Professor and contact information

Professor: David Ross

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Course Website: www.math.hawaii.edu/~ross/671.htm

Professor Website: www.math.hawaii.edu/~ross

Office Hours: See website

The telephone is *not* a good way to reach me, best is always email. I should be around most of the day MWF, and occasionally TTh.

Catalogue Description Independence and conditioning, martingales, ergodic theory, Markov chains, central limit theorem. Pre: 631 (with a grade of B or better) or consent.

Topics This is a first course in measure-theoretic probability theory at the graduate level.

Remark on prerequisites: The course is actually entirely self-contained, though students who have had the officially-required prior exposure to measure theory, and students who have taken a course like Math 471 (probability theory) will have a decided advantage. It is understood that any student enrolled in the course will be comfortable reading and writing mathematical proofs; conversely, any such student should be able to handle the class.

Text: David Williams, Probability With Martingales, CUP 1991. Other useful texts are Patrick Billingsley, Probability and Measure, (Wiley 2012), and the classic texts by Chung, Brieman, and even Feller.

Attendance: Mandatory, though I will not take roll. You are responsible for everything we do in class, even on days you do not attend.

2 Grades

Homework: I will give 8-10 homework sets during the semester. I will ask you to turn in a subset of the problems assigned, and I will only grade a subset of the problems you hand in.

Exams: There will be a midterm and a final exam. I will give these mainly as checks on the homework.

3 Policies

Make-up work Make-up exams will only be given in very unusual circumstances, with one week prior notification (or, in the event of an emergency, *very* strong documentation of that emergency).

Late Papers I reserve the option to not grade or otherwise count these.

Cheating The distinction between working together ("collaboration") and copying from one another ("cheating") is a subtle one. Cheating on the examinations will not be tolerated in this class. It is the student's responsibility to ensure that (s)he does not copy from another student, or let another student copy from him or her. Because homework comprises a large fraction of the semester grade, collaboration there is discouraged as well. If two students genuinely work together on a problem, their written solution should be sufficiently different to make it clear that each understands the solution. One students should never give an answer to another, though hints as to a solution might be OK.

Possible syllabus (depending on preparation of students and how we feel through the semester):

1. **Measure Spaces (2 weeks)** Sigma algebras, Pi and delta systems; Measures: definition, existence theorems; Convergence of measures; Lebesgue measure
2. **Events (1 week)** Examples; Almost sure events; Limit theorems, including Borel-Cantelli
3. **Random variables (2 weeks)** Definition, construction, and examples; CDF and pdf; Skorokhod's Theorem
4. **Independence (1 weeks)** Definition; Examples; Tail events and 0-1 laws
5. **Integration (1 week)** Definition; properties; convergence theorems
6. **Expectation (2 weeks)** Definition; properties; inequalities; Conditional expectation
7. **Product measures and joint distributions (2 week)**
8. **Laws of Large Numbers, Central Limit Theorem, Ergodic Theorems (2 weeks)**
9. **Miscellaneous Topics (2 weeks)**