Measure Theory and Advanced Probability

Instructor: Subhashis Ghosal
MW 8:30-9:45, SAS 1108

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Course content: Preliminaries, Classes of events, random variables, independence, probability measures, integration and expectation, product spaces and joint distributions, convergence of random variables, laws of large numbers, characteristic function, central limit theorems, absolute continuity, conditional expectation and conditional probability.

Background and goals: This course is designed to train graduate students on theoretical foundations of probability theory, integration techniques and properties of random variables and their collections. Techniques learned from this course play important roles in statistical inference and all branches of mathematical statistics. Homework will involve application of the theorems taught in the course in more concrete contexts.

1. Grading Policies: Your final grade is determined by a weighted combination of homework and class performance (25%), mid-term 25% and the final 50%. Plus/minus grading will be used. A rough guide for the grades (including plus/minus) is as follows: 90% for A, 80% for B, 70% for C, 60% for D, less than 60% is F.

2. Homework: Homework problems will be posted on Moodle at least one week prior to the due date. Tentative due dates are Aug 31, Sep 7, 14, 21, 28, Oct 5, 24, 31, Nov 7, 14, 21. Late homework submission is not acceptable. Copying is strictly forbidden, earns no credit and may lead to severe disciplinary action. The worst homework score will be dropped.
3. Course calendar:
First day of class, August 17; Mid-term October 12; No class September 5 (labor day), November 23 (thanksgiving), Last day of class November 30.

4. Exams: There will be two exams in this course:

Mid-term: Wednesday, October 12, 8:30-9:45 am, 1108 SAS Hall.

Final: Monday, December 12, 8-11 am, 1108 SAS Hall.

You can use one formula sheet (letter size, two sided) in the exams.

Missing exam means automatic zero without documented medical reason plus prior permission (except in extreme emergencies).

5. Web and e-mail assistance: Course material including slides will be posted on Moodle; see http://wolfware.ncsu.edu/ and login to ST 779 page. It will be helpful to keep a hard or soft copy of the slides and bring in the class.

E-mail is preferred mode of communication. Homework and other announcements will be posted on Moodle in due time.

6. Attendance and class performance: You are required to attend the class, arrive in time and participate in activities such as in-class problem solving. If you are going to miss a class for a reasonable cause, notify the instructor in advance as a courtesy. See university’s Attendance Regulation (REG02.20.03) for the list of excused absences.

Derivations are not given in the slides but will be done in the class. The text contains proofs of all theorems. The slides are not substitute for the text and the text is required. The slides will be used in the class for a better organization. Occasionally some problems from the text will be discussed in the class. Your participation in the process is highly appreciated and may be rewarded. It will be helpful to bring a copy of the text in the class for convenience.

7. Bonus problems: Occasionally bonus problems will be given. These problems are more challenging than usual homework problems. No solution is to be submitted. Successfully and completely solving a bonus problem at the white board and explaining in the class within time limit will earn bonus credit directly on the composite score. No partial credit is allowed. Bonus problems have to be solved completely unassisted. At most one such bonus point can be given to any student.

To attempt a bonus problem, you need to bid by e-mail. Earliest bidder who has not attempted before will get chance first.

8. Audit Policy: Class attendance, homework (at least 80% score required for passing grade). Auditing students are exempted from taking mid-terms and the final.

9. Accommodation for disabilities: Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services for Students at 1900 Student Health Center, Campus Box 7509, 515-7653. For more information on NC State’s policy on working with students with
disabilities, please see the Academic Accommodations for Students with Disabilities Regulation (REG02.20.01).

10. **Honor pledge**: Submission of any test or assignment, take home or in class, automatically implies agreeing to the following honor ”I have neither given nor received unauthorized aid on this test or assignment”, although students will not have to explicitly sign the honor pledge every time they take a test or assignment.

**Integrity**: University regulations require that every course syllabus remind students that the Code of Student Conduct defines a university policy on academic integrity already pledged by each student. Instructors assume that the students’ names on their submitted work imply compliance with this policy. See [http://www.fis.ncsu.edu/ncsulegal/41.03-codeof.htm](http://www.fis.ncsu.edu/ncsulegal/41.03-codeof.htm)