ST 779 Course Syllabus

ST 779 - Measure Theory and Advanced Probability

Section TBD
FALL 2014
3 Credit Hours

Special Notes
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.

Course Description
Preliminaries, Events and probability, random variables, independence, integration and expectation, inequalities, $L_p$-spaces, product spaces, convergence notions, characteristic function, simplest limit theorems, absolute continuity, conditional expectation and conditional probability, martingales, applications of martingale theory to limit theorems.

Learning Outcomes
Sets and classes, sigma-fields and related structures, probability measures and extensions, random variables, expectation and integration, uniform integrability, inequalities, $L_p$-spaces, product spaces, independence, zero-one laws, convergence notions, characteristic functions, simplest limit theorems, absolute continuity, conditional expectation and conditional probabilities, martingales.

Course Structure
Slides are posted on the web. Print the notes for your use and bring in the class for convenience. Notes are copyright protected and should not be shared with people outside class.

E-mail is preferred mode of communication. Homework and other announcements will be sent by e-mail as well.

Instructors
Dr. Subhashish Bhattacharya (sbhatta4) - Instructor
Email: sbhattacharya@ncsu.edu
Web Page: http://www.freedm.ncsu.edu
Phone: 919-513-7972
Fax: 919-513-0405
Office Location: 4276 SAS Hall
Office Hours: Thursdays 2-3 PM
Prithwish Bhaumik (pbhaumi) - Instructor
Email: pbhaumi@ncsu.edu
North Carolina State University Course Syllabus
ST 779 - TBD - Measure Theory and Advanced Probability

Phone: 9195130190
Office Location: MailBox: 4260 SAS Hall
Office Hours: Monday and Wednesday 2-3 PM at 1101 SAS Hall

Course Meetings

Lecture
- Days: TH
- Time: 11:45am - 1:00pm
- Campus: Main
- Location: 215 Park Shops
  This meeting is required.

Course Materials

Textbooks
- A Probability Path - Sidney Resnick
  Edition: 1999
  Cost: Varies
  This textbook is required.

Expenses
None.

Materials
None.

Requisites and Restrictions

Prerequisites
MA 425/511 and ST 521 or equivalent

Co-requisites
None.

Restrictions
None.

General Education Program (GEP) Information

GEP Category
This course does not fulfill a General Education Program category.

GEP Co-requisites
This course does not fulfill a General Education Program co-requisite.

Transportation
This course will not require students to provide their own transportation. Non-scheduled class time for field trips or out-of-class activities is NOT required for this class.

Safety & Risk Assumptions
None.

Grading

Grade Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
<th>Details</th>
</tr>
</thead>
</table>

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Homework and Class Performance 25%  
Homework problems will be distributed at least one week prior to the due date, about 5–7 problems each time, for 10 weeks. Each question carries 10 points. Score out of 500 points will be calculated. Tentative due dates are Sep 4, 11, 18, 25, Oct 14, 21, 28, Nov 4, 11, 18. Late homework submission is not acceptable. Copying is strictly forbidden, earns no credit and may lead to severe disciplinary action.

Mid-Term 35%  
Tuesday, October 2, 11:45–1:00pm, 215 Park Shops.

Final 40%  
Final: Thursday, December 11, 8–11am, 215 Park Shops.

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

Letter Grades

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>97 ≤</td>
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<tr>
<td>A</td>
<td>93 ≤</td>
</tr>
<tr>
<td>A-</td>
<td>90 ≤</td>
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<tr>
<td>B+</td>
<td>87 ≤</td>
</tr>
<tr>
<td>B</td>
<td>83 ≤</td>
</tr>
<tr>
<td>B-</td>
<td>80 ≤</td>
</tr>
<tr>
<td>C+</td>
<td>77 ≤</td>
</tr>
<tr>
<td>C</td>
<td>73 ≤</td>
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<tr>
<td>D+</td>
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<tr>
<td>D</td>
<td>63 ≤</td>
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<tr>
<td>D-</td>
<td>60 ≤</td>
</tr>
<tr>
<td>F</td>
<td>0 ≤</td>
</tr>
</tbody>
</table>

Requirements for Credit-Only (S/U) Grading

In order to receive a grade of S, students are required to take all exams and quizzes, complete all assignments, and earn a grade of C- or better. Conversion from letter grading to credit only (S/U) grading is subject to university deadlines. Refer to the Registration and Records calendar for deadlines related to grading. For more details refer to http://policies.ncsu.edu/regulation/reg-02-20-15.

Requirements for Auditors (AU)

Information about and requirements for auditing a course can be found at http://policies.ncsu.edu/regulation/reg-02-20-04.

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

Policies on Incomplete Grades

If an extended deadline is not authorized by the instructor or department, an unfinished incomplete grade will automatically change to an F after either (a) the end of the next regular semester in which the student is enrolled (not including summer sessions), or (b) the end of 12 months if the student is not enrolled, whichever is shorter. Incompletes that change to F will count as an attempted course on transcripts. The burden of fulfilling an incomplete grade is the responsibility of the student. The
university policy on incomplete grades is located at http://policies.ncsu.edu/regulation/reg-02-50-3.

**Late Assignments**

**Attendance Policy**
For complete attendance and excused absence policies, please see http://policies.ncsu.edu/regulation/reg-02-20-03

**Attendance Policy**
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.

**Absences Policy**
Missing exam means automatic zero without documented medical reason plus prior permission.

**Makeup Work Policy**
None.

**Additional Excuses Policy**
None.

**Academic Integrity**

**Academic Integrity**
Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct found at http://policies.ncsu.edu/policy/pol-11-35-01

**Academic Honesty**
See http://policies.ncsu.edu/policy/pol-11-35-01 for a detailed explanation of academic honesty.

**Honor Pledge**
Your signature on any test or assignment indicates "I have neither given nor received unauthorized aid on this test or assignment."

**Electronically-Hosted Course Components**
There are no electronically-hosted components for this course.

**Accommodations for Disabilities**
Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, student must register with the Disability Services Office (http://www.ncsu.edu/dso), 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation at http://policies.ncsu.edu/regulation/reg-02-20-01.

**Non-Discrimination Policy**
NC State University provides equality of opportunity in education and employment for all students and employees. Accordingly, NC State affirms its commitment to maintain a work environment for all employees and an academic environment for all students that is free from all forms of discrimination. Discrimination based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation is a violation of state and federal law and/or NC State University policy and will not be tolerated. Harassment of any person (either in the form of quid pro quo or creation of a hostile environment) based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation also is a violation of state and federal law and/or NC State University policy and will not be tolerated. Retaliation against any person who complains about discrimination is also prohibited. NC State’s policies and regulations covering discrimination, harassment, and retaliation may be
accessed at [http://policies.ncsu.edu/policy/pol-04-25-05](http://policies.ncsu.edu/policy/pol-04-25-05) or [http://www.ncsu.edu/equal_op/](http://www.ncsu.edu/equal_op/). Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Equal Opportunity (OEO) at 919-515-3148.

### Course Schedule

**NOTE:** The course schedule is subject to change.

<table>
<thead>
<tr>
<th>Lecture TH 11:45am - 1:00pm — First Day of Class — 08/21/2014 - 08/21/2014</th>
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</thead>
<tbody>
<tr>
<td>Lecture TH 11:45am - 1:00pm — Mid-term — 10/02/2014 - 10/02/2014</td>
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<tr>
<td>Lecture TH 11:45am - 1:00pm — No Class — 10/09/2014 - 10/09/2014</td>
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<tr>
<td>Fall Break</td>
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<tr>
<td>Lecture TH 11:45am - 1:00pm — Thanksgiving — 11/27/2014 - 11/27/2014</td>
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<tr>
<td>Lecture TH 11:45am - 1:00pm — Last Day of Class — 12/02/2014 - 12/02/2014</td>
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