ST 501 Course Syllabus

ST 501 – Fundamentals of Statistical Inference I

Section 001 (available on moodle: https://wolfware.ncsu.edu/)
Fall 2017
3 Credit Hours

Course Description

ST 501 is first of a two-semester sequence in probability and statistics taught at a calculus-based level. The topics include Probability: discrete and continuous distributions, Joint distributions, Expected values and Limit Theorems. A primary objective of the ST501 course is to present techniques and basic results of probability theory at a rigorous level (assumes Calculus III background). The course is intended for Masters students in Statistics and graduate students from other disciplines, such as Financial Mathematics, Economics, and Bioinformatics, that require advanced knowledge in Probability and Statistics. An alternative to this course is ST 701 but credit not given for both ST701 and ST501.

Learning Outcomes

A primary objective of the ST501 course is to present techniques and basic results of probability theory at a rigorous level (assumes Calculus III background). After completing the course, the students will learn the following materials:

(i) Basics of probability theory, (ii) Random variables and probability distributions, (iii) Expected values of random variables and correlations, (iv) Preliminary notions of limit theorems for random variables and (v) Sampling distributions derived from normal distributions

Course Structure

The course consists of following activities: (i) weekly lectures, (ii) at most one HomeWork assignment each week, (iii) a midterm exam and (iv) a final exam. Homework will normally be assigned weekly at the end of class each Wednesday. Homework solution will normally be discussed during the final 15-20 minutes of the class on Wednesdays.

Additional details will be made online course website via moodle

Course Policies

Unexcused late homework will not be accepted. The final homework average will be computed after dropping the two lowest grades. Examinations will be closed book and closed notes. However students will be permitted to bring one 8.5 by 11 inch sheet of notes (printed on both sides) to the midterm exam and two sheets to the final exam. The final exam will be cumulative, but weighted towards the materials covered after the midterm. Students may bring calculators to all exams, in addition to pen/pencil and scratch papers. No cell phones or other electronic devices should be in sight or used in any way during exams.
Instructors

Sujit K Ghosh (sghosh2) - Instructor
Email: sujit.ghosh@ncsu.edu
Web Page: http://www.stat.ncsu.edu/people/ghosh/
Phone: 9195152570
Fax: 9195157591
Office Location: 5126 SAS Hall
Office Hours: Wednesday 3:00pm - 5:00pm

Zhen Li (zli34) - Teaching Assistant
Email: zli34@ncsu.edu
Phone: 919-917-1290
Office Location: 1101 SAS Hall (Statistics Tutorial center)
Office Hours: Monday 3:00pm - 5:00pm

Course Meetings

Lecture

Days: MW
Time: 10:15am - 11:30am
Campus: Main
Location: 1216 SAS Hall, Main Campus, NCSU
This meeting is required.

Course Materials

Textbooks

Mathematical Statistics and Data Analysis - John A. Rice
Edition: 3rd Edition
ISBN: 1337823619
Cost: $199.95 (bound book), $18.99 (e-book)
This textbook is required.

Expenses

None.

Materials

R software: https://www.r-project.org/ - 0
This material is optional.

Requisites and Restrictions

Prerequisites

MA 242

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>
<tbody>
<tr>
<td>Homework</td>
<td>15</td>
<td>The final homework average will be computed after dropping the two lowest grades. As the lowest two scores are dropped, no late assignments are accepted.</td>
</tr>
<tr>
<td>Midterm Exam (Oct 9, 2017)</td>
<td>35</td>
<td>Examination will be closed book and closed notes. However students will be permitted to bring one 8.5 by 11 inch sheet of notes (printed on both sides) to the midterm exam. Student must contact the instructor in advance if s/he is likely to miss the scheduled midterm exam</td>
</tr>
<tr>
<td>R Project</td>
<td>5</td>
<td>Toward the end of the semester, there will be a larger R project done in small groups.</td>
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<tr>
<td>Final Exam (Dec 4, 2017)</td>
<td>45</td>
<td>Examination will be closed book and closed notes. However students will be permitted to bring two 8.5 by 11 inch sheet of notes (printed on both sides) to the final exam. The final exam will be cumulative, but weighted towards the materials covered after the midterm.</td>
</tr>
</tbody>
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Letter Grades

This Course uses Standard NCSU Letter Grading:

- $97 \leq A+ \leq 100$
- $93 \leq A < 97$
- $90 \leq A- < 93$
- $87 \leq B+ < 90$
- $83 \leq B < 87$
- $80 \leq B- < 83$
- $77 \leq C+ < 80$
- $73 \leq C < 77$
- $70 \leq C- < 73$
- $67 \leq D+ < 70$
- $63 \leq D < 67$
- $60 \leq D- < 63$
- $0 \leq F < 60$

Requirements for Credit-Only (S/U) Grading

Performance in research, seminar and independent study types of courses (6xx and 8xx) is evaluated as either "S" (Satisfactory) or "U" (Unsatisfactory), and these grades are not used in computing the grade point average. For credit only courses (S/U) the requirements necessary to obtain the grade of "S" must be clearly outlined.

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.

Auditors are expected to attend class regularly and submit homework on the same schedule as the other students. The final grade for auditors (AU or NR) will be based on their final homework average (final homework will be calculated by dropping the two lowest grades). A final homework score of at least 75% is required for an AU.

Policies on Incomplete Grades

If an extended deadline is not authorized by the Graduate School, 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) by 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-02-50-03. Additional information relative to incomplete grades for graduate students can be found in the Graduate Administrative Handbook in Section 3.18.F at http://www.fis.ncsu.edu/grad_publicns/handbook/

Late Assignments

Contact the instructor in advance if you are going to be late or miss an assignment. Prior email notice to the instructor in sufficient time to allow for discussing an alternative schedule is required. The instructor will review late requests and circumstances on a case by case basis.
and make decisions accordingly. If an emergency arises that prevents you from completing
your work on time, please email the instructor as soon as possible so that arrangements can
be made for you to keep up in the class. If a late submission has been requested in advance of
the due date and the instructor grants an extension, no points will be deducted from the
assignment grade. Incomplete grades will not be given except under extenuating
circumstances that are discussed with your instructor prior to posting final grades.

**Attendance Policy**

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

**Attendance Policy**

Students are expected to attend all lectures and exams.

**Absences Policy**

None.

**Makeup Work Policy**

Students who are unable to attend an exam for a legitimate unavoidable reason may
take a make-up exam only if the student provides suitable documentation of the delay
and they are able to take the make-up in a very timely manner. If a make-up can't be
taken the final exam will be reweighted for the midterm exam.

**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

It is the understanding and expectation that a student's signature on any test or
assignment means that the student neither gave nor received unauthorized aid. I allow
students to work in groups on homework if they like, but no one should copy directly from
someone else's paper (either present or past students). I strongly urge everyone to work
on their own as much as possible.

**Academic Honesty**

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

None.

**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**
Students may be required to disclose personally identifiable information to other students in the course, via electronic tools like email or web-postings, where relevant to the course. Examples include online discussions of class topics, and posting of student coursework. All students are expected to respect the privacy of each other by not sharing or using such information outside the course.

**Electronically-hosted Components:** https://courses.ncsu.edu/st501/

### Accommodations for Disabilities

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Services Office at Suite 2221, Student Health Center, Campus Box 7509, 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 (REG02.20.01) (https://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 or 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.

**Lecture MW 10:15am - 11:30am — Semester schedule (draft) — 08/16/2017 - 11/29/2017**

In ST501 we shall cover most, but not all of the material in chapters 1 through 6 of textbook by John A. Rice.
1. *Probability*: axiomatic foundations; combinatorics; conditional probability and independence (~3 lectures)
2. *Random Variables*: discrete random variables; continuous random variables; functions of random variables (~4 lectures)
3. *Joint distributions*: discrete and continuous bivariate distributions; conditional distributions and independent random variables; functions of multiple random variables (~4 lectures)
4. *Expected values*: mean, variance and higher moments of random variables; covariance and correlation; conditional expectations and prediction; moment generating functions (~4 lectures)
5. *Limit Theorems*: law of large numbers; concepts of convergence of random variables; central limit theorem (~3 lectures)
6. *Sampling Distributions*: chi-square, t and F distributions