

ST 502

## Fundamentals of Statistical Inference II

Mondays/Wednesdays, 13:30–14:45, 3218 Broughton Hall

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Office location: 5218 SAS Hall

Office hours: 15:00-18:00 Mondays/Tuesdays, and by appointment

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**Course Description:** Second of a two-semester sequence in probability and statistics taught at a calculus-based level. Statistical inference: methods of construction and evaluation of estimators, hypothesis tests, and interval estimators, including maximum likelihood.

**Prerequisite(s):** ST 501 and Calculus.

**Credit Hours:** 3

**Text(s):** *Mathematical Statistics and Data Analysis*, 3<sup>rd</sup> Edition

**Author(s):** John A Rice; **ISBN-13:** 978-0-534-39942-9

### Grade Distribution:

Assignments	10%
Midterm Exam 1	30%
Midterm Exam 2	30%
Final Project and Presentation	30%

### Letter Grade Distribution:

$\geq 93.00$	A	73.00 - 76.99	C
90.00 - 92.99	A-	70.00 - 72.99	C-
87.00 - 89.99	B+	67.00 - 69.99	D+
83.00 - 86.99	B	63.00 - 66.99	D
80.00 - 82.99	B-	60.00 - 62.99	D-
77.00 - 79.99	C+	$\leq 59.99$	F

**Personal note to students:** Please do not feel intimidated about interacting with the me. Regardless of how busy or stressed I may appear to you, teaching your class is a part of my job, and I take that very seriously. I care deeply about the quality of your learning. Please always reach out to me if you have questions, concerns, or need help. I understand that it can be difficult and can even feel embarrassing to ask for help. However, I was once in your position, and I promise to always treat you with respect, empathy, and kindness. Nobody that ever did anything meaningful did so without first failing over and over again.

## Course policies and commentary:

- **Assignments**

- Homework will be assigned each Wednesday, and will be due the following Wednesday **at the start of class**. Revisions to assignment due dates will be posted on the course website.
- Each homework assignment will receive the same weight in the calculation of the final course grade (i.e., longer (shorter) assignments do not count for a larger (smaller) portion of the overall assignment course grade). For each assignment, each exercise will receive 1 point of credit if the solution is correct and 0 points of credit otherwise. No partial credit will be given on homework assignments.
- No late assignments will be accepted. Reach out to the instructor if you begin to fall behind!
- It is strongly encouraged for you to work with classmates on all homework assignments. You will learn a lot about what you do and do not understand when you discuss your ideas and solutions with others, and you will expand the way you think when you understand the ideas and solutions of others.
- If you are not confident that you have correctly solved all homework problems before submitting each assignment, then you are not making adequate use of available resources (i.e., discussions with classmates, lectures notes, textbook, open-source materials available online, office hours).
- Take responsibility for understanding solutions to all assignments. For example, if you find a solution on StackExchange, then convince yourself that the solution is actually correct.
- **Learn to distinguish between the things you *do* know and the things you *do not* know** (this is one of the most important results of all education). To understand, to *a* particular degree, that a given statement is true means that you can explain why the statement is true, to *the* particular degree.

- **Exams**

- All exams are closed-book and closed-notes. Any communication with other students is strictly prohibited during exams.
- A study guide will be provided by the instructor prior to each exam.
- **For only the first exam of the course**, students receiving a grade of less than 70 percent will have the opportunity to improve their exam grade to 70 percent. To do so, students must correct all mistakes made on their exam, and meet with the instructor individually to discuss their exam mistakes. These students will be expected to correctly solve and explain the solutions to all problems that were not correctly solved during the exam. The point of this clause is (1) to decrease student anxiety about the exam portion of their grade, (2) to facilitate/encourage personal student-instructor interaction for students that may need extra help in the course, and (3) for the instructor to address specific learning challenges and concerns for students.

- **Final Project and Presentation**

- For the final project and presentation, students must form teams of 2-3 students of their choosing. Each team must email the instructor to declare team members by Wednesday, August 28th, 2019.
- Teams will select a published paper from a statistics journal, and will be tasked with replicating the numerical results of the chosen paper. A one page proposal for a chosen project must be submitted and approved before each team may proceed with their project. The one page proposal will provide a citation for the chosen publication, along with a description of which part(s) of the publication will be replicated for the final project. Additionally, the proposal document will describe how to obtain any necessary data for replicating the results of the chosen publication. Teams are encouraged to email the corresponding author of their chosen paper to access data sets and/or code. Proposal documents are due on Wednesday, September 18th, 2019.
- All projects must be written in either the R, Python, or Julia programming languages. Final project reports must be typeset in LaTeX.
- The final presentation will be in teams, and held during the final exam period for the course. Presenting time allotments for each team will depend on course enrollment.
- Further details regarding the specifics of the final project and presentation will be provided by the instructor.

- **Attendance**

- Use lecture time (or not) as you feel most productive, but do not use it in a way which is distracting to others.
- Lecture time is not for answering homework questions; please visit office hours with homework questions.

### Tentative Course Outline:

Week	Content
Week 1	<ul style="list-style-type: none"> <li>• Review of ST 501</li> <li>• Chapter 1 and 2 from Rice</li> </ul>
Week 2	<ul style="list-style-type: none"> <li>• Review of ST 501</li> <li>• Chapters 3, 4, and 5 from Rice</li> <li>• <b>Declare team members – Wednesday, August 28th, 2019</b></li> </ul>
Week 3	<ul style="list-style-type: none"> <li>• Distributions Derived from the Normal Distribution</li> <li>• Chapter 6 from Rice</li> </ul>
Week 4	<ul style="list-style-type: none"> <li>• Sampling Distributions</li> <li>• Chapter 7 from Rice</li> </ul>
Week 5	<ul style="list-style-type: none"> <li>• Parameter Estimation</li> <li>• Chapter 8 from Rice</li> <li>• <b>Proposal documents due – Wednesday, September 18th, 2019</b></li> </ul>
Week 6	<ul style="list-style-type: none"> <li>• Parameter Estimation</li> <li>• Chapter 8 from Rice</li> </ul>
Week 7	<ul style="list-style-type: none"> <li>• Parameter Estimation</li> <li>• Chapter 8 from Rice</li> </ul>
Week 8	<ul style="list-style-type: none"> <li>• Hypothesis Testing and Goodness of Fit</li> <li>• Chapter 9 from Rice</li> <li>• <b>Midterm 1 – Monday, October 7th, 2019</b></li> </ul>
Week 9	<ul style="list-style-type: none"> <li>• Hypothesis Testing and Goodness of Fit</li> <li>• Chapter 9 from Rice</li> </ul>
Week 10	<ul style="list-style-type: none"> <li>• Hypothesis Testing and Goodness of Fit</li> <li>• Chapter 9 from Rice</li> </ul>
Week 11	<ul style="list-style-type: none"> <li>• Summarizing Data</li> <li>• Chapter 10 from Rice</li> </ul>
Week 12	<ul style="list-style-type: none"> <li>• Comparing Two Samples</li> <li>• Chapter 11 from Rice</li> </ul>
Week 13	<ul style="list-style-type: none"> <li>• Analysis of Variance</li> <li>• Chapter 12 from Rice</li> </ul>
Week 14	<ul style="list-style-type: none"> <li>• Analysis of Categorical Data</li> <li>• Chapter 13 from Rice</li> <li>• <b>Midterm 2 – Monday, November 18th, 2019</b></li> </ul>
Week 15	<ul style="list-style-type: none"> <li>• Linear Least Squares</li> <li>• Chapter 14 from Rice</li> </ul>
Week 16	<ul style="list-style-type: none"> <li>• Linear Least Squares</li> <li>• Chapter 14 from Rice</li> </ul>

**NCSU Policies, Regulations, and Rules (PRR):** Students are responsible for reviewing the NC State University PRR's which pertain to their course rights and responsibilities:

- Equal Opportunity and Non-Discrimination Policy Statement <https://policies.ncsu.edu/policy/pol-04-25-05> with additional references at <https://oied.ncsu.edu/equity/policies/>
- Code of Student Conduct <https://policies.ncsu.edu/policy/pol-11-35-01>
- Grades and Grade Point Average <https://policies.ncsu.edu/regulation/reg-02-50-03>
- Credit-Only Courses <https://policies.ncsu.edu/regulation/reg-02-20-15>
- Audits <https://policies.ncsu.edu/regulation/reg-02-20-04>

**Policy on Academic Integrity:** The Code of Student Conduct defines a university policy on academic integrity: <https://policies.ncsu.edu/policy/pol-11-35-01>. Your signature on work submitted for grading implies compliance with this policy. Cheating, plagiarism and other forms of academic dishonesty will not be tolerated. Violation of the Code of Student Conduct will be reported and severe penalties will be enforced.

**Disability Services for Students:** Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Resource Office at Holmes Hall, Suite 304, 2751 Cates Avenue, 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)