

Tentative Syllabus

NOTE: This is a tentative outline for the course and may be updated based on instructor discretion. Changes may result due to students' progress in the course or changes in instructional priorities.

Teaching Assistant: Yuqi Tian

Schedule:

Lectures and Labs:

- Monday: 11am – 12pm
- Wednesday: 11am – 12pm
- Friday: 10am -12pm

Instructor's Office Hours:

- Monday: 2:45pm-3:45pm in room 11116 on the 11th floor of 2525 West End
- Friday: 2:45pm-3:45pm in room 11116 on the 11th floor of 2525 West End

TA's Office Hours:

- Wednesday 3:30-4:30 in room 11139 on the 11th floor of 2525 West End

Textbook:

Statistical Inference, Second Edition George Casella and Roger L. Berger

Homework:

- Assigned weekly or biweekly depending on flow of course.
- Tentative due dates are given in the course schedule below but this is subject to change. Any changes will be discussed in class and may not be updated on course website though efforts will be made to update the course website as well.
- It is the students' responsibility to check the due dates of all homework assignments.
- Homework is due at the beginning of class on the date noted.
- You can either email the instructor, cc'ing the TA, a scanned or typed assignment (recommend LaTeX, <https://www.latex-project.org>, for typed) by the beginning of class on the day it is due or turn in a handwritten assignment at the beginning of class.
- Please contact the instructor via email if you are unable to meet the homework deadline.
- Students are encouraged to work together on homework problems, but they must turn in their own write-ups and work independently on exams.

Software:

- Labs and some homework assignments require the R statistical software (<https://www.r-project.org> and <https://www.rstudio.com>)

Other Information:

- Students are encouraged to read the corresponding sections in book outside of class.
- Laptops should be brought to labs on Fridays

Odds and Ends:

- Vanderbilt University has resources available to graduates students for their health (<https://www.vumc.org/student-health/>) and mental wellbeing (<https://www.vanderbilt.edu/ucc/>).

| Date | Topic | Reading Section(s) | Homework or Lab Due |
|--------|--|--------------------|---|
| Aug 22 | Introduction and Set Theory | 1.1 | |
| Aug 24 | Axiomatic Foundations/Calculus of Probabilities | 1.2 | Lab 1: Poker Probabilities |
| Aug 27 | Counting/Enumerating Outcome | 1.2 | |
| Aug 29 | Conditional Probability and Independence | 1.3 | |
| Aug 31 | Conditional Probability and Independence Cont./Discuss Homework 1 questions | | Homework 1 Due Lab 2: Birthday problem |
| Sep 3 | Labor Day | | |
| Sep 5 | Random Variables/Distribution | 1.4-1.5 | |
| Sep 7 | Random Variables/Distribution | 1.4-1.5 | Lab 3: Averages/Bootstrap |
| Sep 10 | Density and Mass Functions | 1.6 | |
| Sep 12 | Distributions of Functions of a Random Variable | 2.1 | |
| Sep 14 | Expected Values | 2.2 | Homework 2 Due Lab 4: Distributions and Transformations |
| Sep 17 | Moments and Moment Generating Functions | 2.3 | |
| Sep 19 | Discrete Distributions | 3.1-3.2 | |
| Sep 21 | Review and Discuss Homework 3 Problems | | Homework 3 Due Lab 5: Review for Exam |
| Sep 24 | Continuous Distributions | 3.3 | |
| Sep 26 | Exam | | |
| Sep 28 | Review and Discuss Homework 4 Problems | | Homework 4 Due (Note: We will discuss this homework in class so has to be turned |

| | | | |
|--------|---|-------------|--|
| | | | in by beginning of class) Lab 6: Review and discuss Exam |
| Oct 1 | Exponential Families /Location and Scale Families | 3.4-3.5 | |
| Oct 3 | Joint and Marginal Distributions | 4.1 | Homework 5 Due |
| Oct 5 | Review and Discuss Homework 5 problems | | Lab 7: Survival Analysis (Exponential Distributions and Censoring) |
| Oct 8 | Conditional Distributions and Independence | 4.2 | |
| Oct 10 | Bivariate Transformations | 4.3 | Homework 6 Due |
| Oct 12 | Review and Discuss Homework 6 problems | | Lab 8: |
| Oct 15 | Hierarchical Models and Mixture | 4.4 | |
| Oct 17 | Covariance and Correlation | 4.5 | |
| Oct 19 | Fall Break | | |
| Oct 22 | Multivariate Distributions | 4.6 | |
| Oct 24 | Inequalities and Identities | 3.6 and 4.7 | Homework 7 Due |
| Oct 26 | Review and Discuss Homework 7 problems | | Lab 9: Review for Exam |
| Oct 29 | Exam | | |
| Oct 31 | Random Samples and Sums of Random Variables | 5.1-5.2 | |
| Nov 2 | Review and Discuss EXAM | | Lab 10: Ordinal Residual |
| Nov 5 | Normal Distribution (Properties of Sample Mean and Variance) | 5.3 | |
| Nov 7 | Normal Distribution (Derived Distributions) | 5.3 | Homework 8 Due |
| Nov 9 | Review and Discuss Homework 8 Problems | | Lab 11: Approaches for generating a random sample |
| Nov 12 | Order Statistics | 5.4 | |
| Nov 14 | Convergence Concepts (convergence in probability, a.s., distribution) | 5.5 | Homework 9 Due |
| Nov 16 | Review and Discuss Homework 9 Problems | 5.6 | Lab 12: Approaches for generating a random sample continued |
| Nov 19 | Thanksgiving Break | | |

| | | | |
|--------|--|-----|---|
| Nov 21 | Thanksgiving Break | | |
| Nov 23 | Thanksgiving Break | | |
| Nov 26 | Convergence Concepts (central limit theorem) | 5.5 | |
| Nov 28 | Convergence Concepts (delta method) | 5.5 | Homework 10 Due |
| Nov 30 | Review and Discuss Homework 10 Problems | | Lab 13: Approaches for generating a random sample |
| Dec 3 | To be determined | | Homework 11 Due |
| Dec 5 | Review and Discuss Homework 11 Problems | | |
| Dec 7 | Final Exam Review | | |
| Dec 10 | Final Exams | | |
| Dec 12 | Final Exams | | |
| Dec 14 | Final Exams | | |