



STA 329 Intermediate Statistical Analysis

Summer 2024

Course Credits: 4

Contact Hours: 56 hours

Instructor: TBA

Email: TBA

COURSE OBJECTIVES

Intermediate Statistics is a challenging course designed to delve into advanced statistical theory and methods. This course covers fundamental empirical process theory, convergence, point and interval estimation, maximum likelihood, hypothesis testing, Bayesian inference, non-parametric statistics, sampling distributions, and issues related to hypothesis testing. Through a blend of theoretical foundations and practical applications, students will gain a deeper understanding of key statistical concepts and develop the skills necessary to address real-world problems.

Upon completion of this course, students will be able to:

1. Understand and apply fundamental empirical process theory.
2. Master the convergence properties of statistical estimation.
3. Grasp the principles and applications of point and interval estimation.
4. Proficiently apply maximum likelihood estimation methods.
5. Understand the basic concepts and methods of hypothesis testing.
6. Gain insight into the role and application of Bayesian inference in statistics.
7. Familiarity with non-parametric statistical methods and their applications.
8. Comprehend the principles of sampling distributions.
9. Develop the ability to independently address issues related to hypothesis testing.

PREREQUISITES

STA 150 Statistical Probability

GRADING

Grades will be determined by accumulating points, with 100 points being the maximum, as follows:



ITEM	POINTS
2 Projects	20 Points
2 Reports	20 Points
Midterm Exam	35 Points
Final Paper	25 Points
Total	100 Points

Late submissions will be graded at the end of the course. Grades will be assigned according to the following rule:

$$A \geq 90 > B \geq 80 > C \geq 70 > D \geq 60 > F.$$

We reserve the right to make adjustments to the overall grading policy.

COURSE MATERIALS

Required Texts:

1. Casella, G., & Berger, R. L. (2002), *Statistical Inference*, Duxbury Press.
2. Gelman, A., Carlin, J. B., Stern, H. S., Dunson, D. B., Vehtari, A., & Rubin, D. B. (2013), *Bayesian Data Analysis*, Chapman and Hall/CRC.

Recommended (Optional) Texts or Other Materials:

None

COURSE TOPICS

MODULE	TASKS
Module 1	<p>Topics: Topic 1: Equiprobable Sampling vs. Non-equiprobable Sampling Topic 2: Law of Large Numbers and Central Limit Theorem Topic 3: Convergence and its Applications in Statistics Topic 4: Basic Framework of Statistical Inference</p> <p>Assessments: Project # 1</p>
Module 2	<p>Topics: Topic 5: Fundamental Theories of Point and Interval Estimation Topic 6: Properties and Application of Maximum Likelihood Estimation Topic 7: Basic Concepts of Hypothesis Testing Topic 8: Single-parameter Hypothesis Testing</p>



	Assessments: Report # 1
Module 3	Topics: Topic 9: Multi-parameter Hypothesis Testing Topic 10: Principles of Analogy Estimation and Bayesian Inference Topic 11: Prior Selection and Sensitivity Analysis in Bayesian Statistics Topic 12: Basics of Non-parametric Statistical Methods Assessments: Midterm Exam
Module 4	Topics: Topic 13: Kernel Density Estimation and Kernel Regression Topic 14: Resampling Methods (Bootstrap) Topic 15: Bootstrap Regression Topic 16: Bias-Variance Tradeoff Assessments: Project # 2
Module 5	Topics: Topic 17: Small Sample Theory Topic 18: Multivariate Statistical Analysis Topic 19: Spatial Statistics Topic 20: Applications of Statistics Assessments: Report # 2 Final Paper

ATTENDANCE

1) Class attendance is required. Missing classes without permission will lead to decrease in overall grade.

Missing less than two classes: no penalty.

Missing more than two classes: 7% will be taken off from the overall grade.

If the instructor reports a student's frequent missing of class to the Soochow University Academic Administration Office, the student might get a written warning and might be prohibited from attending final exam.

2) Participants in this course are expected to arrive in class promptly and adequately prepared. The primary objective of this course is to critically engage with the readings and the subject matter. Therefore, course participants are expected to have completed the reading prior to class and prepare thoughtful reflections/commentaries to share



with fellow colleagues.

LEARNING REQUIREMENTS

- 1) Late assignments are not acceptable and are subjected to grade deductions.
- 2) Assignments submitted in the wrong format will be counted as not submitted.
- 3) Failure to submit or fulfill any required course component results in failure of the class.
- 4) Make-up for midterm and final exams only with valid excuses, as defined by the University.
- 5) In order to earn a Certificate of Completion, participants must thoughtfully complete all assignments by stated deadlines and earn an average quiz score of 50% or greater.

TECHNOLOGY POLICY

The use of electronic devices in class is distracting, both for the user and for the rest of the class. Only non-programmable calculators can be used in the tests and exam. Any attempts to use cell phones and other electronic communication devices will be seemed as cheating. Laptops are discouraged, unless you use them for activities DIRECTLY related to the course (e.g., note taking, reading course documents).

ACADEMIC INTEGRITY POLICY

Soochow University highly values the academic integrity and aims to promote the academic fairness, honesty and responsibility. Any academic dishonesty behaviors and any attempts to cheats and plagiarism will be reported to the university administration office. A written warning and the relevant penalties will be imposed. The record might be shown on the official university transcript.

DISABILITY ACCOMMODATION

Soochow University is committed to maintaining a barrier-free environment so that students with disabilities can fully access programs, courses, services, and activities at Soochow University. Students with disabilities who require accommodations for access to and/or participation in this course are welcome.



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Note:

Please contact the University Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material.