STA 253 Engineering Probability and Statistics

Summer 2024

Course Credits: 4
Contact Hours: 56 hours
Instructor: TBA
Email:TBA

COURSE OBJECTIVES

This course is designed to introduce engineering students to the fundamental principles of probability theory and statistics. It bridges the gap between theoretical concepts and their practical applications in engineering, providing students with a solid foundation for analyzing and interpreting data in engineering projects. The course emphasizes both discrete and continuous probability distributions, estimation theory, hypothesis testing, descriptive statistics, probabilistic models, confidence intervals, simple linear regression, analysis of variance (ANOVA), experimental design, and more. In addition, this course will deeply combine the statistical methods with practical applications, as well as aim at cultivating students' ability to analyze and apply statistical data.

Upon Completion of this Course, students will be able to:

1. Develop an understanding of probability theory and its role in engineering;
2. Learn about different types of random variables and their probability distributions;
3. Master the techniques of descriptive and inferential statistics;
4. Apply statistical methods to solve engineering problems;
5. Perform hypothesis testing and parameter estimation;
6. Construct confidence intervals for population parameters;
7. Design and analyze experiments using ANOVA and linear regression;
8. Evaluate and interpret the results of statistical analyses.

PREREQUISITES

MAT 222 Multivariable Calculus

GRADING

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

ITEM	POINTS
2 Assignments	20 Points
2 Quizzes	20 Points
Midterm Exam	25 Points
Final Exam	35 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:

Statistics for Engineers and Scientists byWilliam Navidi, 5th Edition, McGraw-Hill Education, 2019.

Recommended (Optional) Texts or Other Materials:

None

COURSE TOPICS

MODULE	TASKS

Module 1	**Topics:** Topic 1: Course Introduction Topic 2: Basic Concepts of Probability Topic 3: Discrete Random Variables and Probability Mass Functions Topic 4: Continuous Random Variables and Probability Density Functions **Assessments:** Assignment #1
Module 2	**Topics:** Topic 5: Joint Probability Distributions Topic 6: Moments and Transformations of Random Variables Topic 7: Sampling and Sampling Distributions Topic 8: Descriptive Statistics: Measures of Central Tendency and Dispersion **Assessments:** Quiz #1
Module 3	**Topics:** Topic 9: Probability Plotting and Normal Probability Topic 10: The Binomial Distribution Topic 11: Poisson and Exponential Distributions Topic 12: Gaussian (Normal) Distributions **Assessments:** Assignment #2 Midterm Exam
Module 4	**Topics:** Topic 13: Multivariate Distributions Topic 14: Correlation and Regression Analysis Topic 15: Analysis of Variance (ANOVA) Topic 16: Point Estimation, Interval Estimation and Bayesian Estimation **Assessments:** Quiz #2
Module 5	**Topics:** Topic 17: Confidence Intervals Topic 18: Hypothesis Testing: One Sample Tests and Two Sample Tests Topic 19: Nonparametric Tests: Sign Test,Rank-Sum Test, Random Test, Kolmogorov-Smirnov, and Anderson-Darling Tests Topic 20: Application in Engineering Probability and Statistics **Assessments:** Final Exam

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 (eg., note taking, reading course documents).

ACEDEMIC 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.

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.