STA 488 Probability Fundamentals

Winter 2024

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

COURSE OBJECTIVES

This is an introductory course in probability theory, designed to provide students with a strong foundation in the fundamental concepts and techniques of probability. Probability theory is a key component of statistics, and this course serves as a prerequisite for more advanced courses in statistics and data analysis. Topics covered include probability spaces, random variables, probability distributions, and various principles and theorems that form the basis of probability theory. And focused on discrete and continuous probability distributions, Markov Chains.

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

1. Learn to work with joint probability distributions and understand their properties.

2. Be proficient in calculating probabilities for both discrete and continuous random variables.

3. Describe and compute probabilities of events using axiomatic probability.

4. Develop problem-solving and critical-thinking skills through the application of probability theory.

5. Apply the principles of probability to real-world problems and decision-making.

PREREQUISITES

STA 310 Probability and Stochastic Processes

GRADING

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

ITEM	POINTS
Quizzes	20 Points
Projects	20 Points
Midterm 1	15 Points
Midterm 2	15 Points
Final Exam	30 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 ≥ 90 > B ≥ 80 > C ≥ 70 > D ≥ 60 > F.

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

COURSE MATERIALS

Required Texts:

1. Saeed Ghahramani, *Fundamentals of Probability: With Stochastic Processes*, 4th Edition, Chapman & Hall, 2019.

2. Michael Kouritzin, *Step By Step Probability*.

Recommended (Optional) Texts or Other Materials:

None

COURSE TOPICS

MODULE	TASKS
Module 1	**Topics:** Topic 1: Counting and Probability Topic 2: Theory of Random Vectors Topic 3: Probability of Independent Trials Topic 4: Continuous Random Vectors **Assessments:** Quiz#1

Module 2	**Topics:** Topic 5: Reliability and Continuous Random Vectors Topic 6: Statistical Tests and Estimation Topic 7: List Length and Counting Processes Topic 8: Data Communications and Queuing Processes **Assessments:** Quiz#2 Project#1
Module 3	**Topics:** Topic 9: Notation and Formulae Topic 10: Calculus Problems Topic 11: The Markov Property and Chains Topic 12: Markov Chain Simulation and Stationary Distributions **Assessments:** Midterm#1 Project#2
Module 4	**Topics:** Topic 13: Recurrence and Transience of Markov Chains Topic 14: Variances and Moments of Discrete Random Variables Topic 15: Special Discrete Distributions Topic 16: Continuous Random Variables **Assessments:** Midterm#2
Module 5	**Topics:** Topic 17: Special Continuous Distributions Topic 18: Bivariate Distributions Topic 19: Sums of Independent Random Variables and Limit Theorems Topic 20: Stochastic Processes **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.