Soochow University

MAT 446 Applied Probability

Summer 2024

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

COURSE OBJECTIVES

This course provides students with a comprehensive understanding of probability theory and its practical applications in various fields. Beginning with a review of basic probability concepts, including combinatorics, axioms, and elementary distributions, the course progresses to cover advanced topics such as limit theorems, conditioning, and the Poisson process. Special emphasis is placed on Markov processes, both discrete-time and continuous-time, and their applications in signal processing, queuing theory, economics, finance, and actuarial sciences. Additionally, students will explore hidden Markov processes in finite state spaces, gaining insight into their theoretical foundations and real-world implications.

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

1. Understand elementary probability concepts and applications;

2. Analyze and model stochastic processes, particularly Markov processes;

3. Explore hidden Markov processes and their applications in modeling uncertain systems;

4. Extend probability knowledge with advanced results and techniques;

5. Solve probability problems effectively and communicate solutions clearly with proper terminology and notation.

PREREQUISITES

STA 202 Introduction to Probability

GRADING

Soochow University

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

ITEM	POINTS
Quizzes	20 Points
Midterm 1	15 Points
Midterm 2	15 Points
Project	20 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:

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

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

COURSE MATERIALS

Required Texts:

Leonard A. Asimow, *Probability and Statistics with Applications: A Problem Solving Text*, 1st Edition, ACTEX Publications, 2010.

Recommended (Optional) Texts or Other Materials:

None

COURSE TOPICS

MODULE	TASKS
Module 1	**Topics:** Topic 1: Basic Probability Concepts and Definitions Topic 2: Combinatorics: Permutations and Combinations Topic 3: Probability Laws and Axioms Topic 4: Conditional Probability and Independence **Assessments:** Quiz#1

Module 2	**Topics:** Topic 5: Bayes' Theorem and its Applications Topic 6: Random Variables: Discrete and Continuous Topic 7: Probability Distributions: Binomial, Poisson, and Normal Topic 8: Joint Probability Distributions **Assessments:** Quiz#2 Project
Module 3	**Topics:** Topic 9: Expectation and Variance Topic 10: Covariance and Correlation Topic 11: The Central Limit Theorem Topic 12: Sampling Distributions and Estimation **Assessments:** Midterm#1 Project
Module 4	**Topics:** Topic 13: Hypothesis Testing: Principles and Procedures Topic 14: Confidence Intervals Topic 15: Simple Linear Regression Topic 16: Multiple Linear Regression **Assessments:** Midterm#2 Project due
Module 5	**Topics:** Topic 17: Analysis of Variance (ANOVA) Topic 18: Nonparametric Methods in Statistics Topic 19: Time Series Analysis Topic 20: Probability Applications in Finance and Economics **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.