MATH 768: Probability Theory
Spring 2025 Course Syllabus

NJIT Academic Integrity Code: All Students should be aware that the Department of Mathematical Sciences takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

Please be sure you read and fully understand our DMS Online Exam Policy.

COURSE INFORMATION

Course Description: Measure theoretic introduction to axiomatic probability. Probability measures on abstract spaces and integration. Random variables and distribution functions, independence, 0-1 laws, basic inequalities, modes of convergence and their interrelationships, Laplace-Stieltjes transforms and characteristic functions, weak and strong laws of large numbers, conditional expectation, discrete time martingales. Effective From: Spring 2009.

Number of Credits: 3

Prerequisites: Math 645 or departmental approval.

Course-Section and Instructors:

Course-Section	Instructor
Math 768-002	Professor S. Dhar

Office Hours for All Math Instructors: Spring 2025 Office Hours and Emails

Required Textbooks:

Title	*Probability and Measure, Anniversary Edition*
Author	Patrick Billingsley
Edition	3rd
Publisher	Wiley
ISBN #	9781118122372

Title	*A Course in Probability Theory*
Author	Kai Lai Chung
Edition	3rd
Publisher	Academic Press
ISBN #	978-0121741518

University-wide Withdrawal Date: The last day to withdraw with a **W** is **Monday, April 7, 2025**. It will be strictly enforced.

COURSE GOALS

Course Objectives

This course will focus on the first seven chapters of Kai Lai Chung's Probability Theory. Topics include probability measures on abstract spaces, random variables and distribution functions, independence, basic probability inequalities, various modes of convergence and their interrelationships, characteristic functions, weak and strong laws of large numbers, and the central limit theorem.

Course Outcomes

On successful completion, students will be able to demonstrate understanding of the following topics:

- Probability measures on abstract spaces
- Random variables as measurable mappings and their induced distributions
- Independence
- Various modes of convergence especially the fundamental vague/weak convergence
- Weak and strong laws of large numbers; convergence of random series
- Characteristic functions and their application in advanced probability
- Central limit theorems

Course Assessment: Will be based on regular homework, one midterm exam, presentation project, and one final exam.

POLICIES

DMS Course Policies: All DMS students must familiarize themselves with, and adhere to, the Department of Mathematical Sciences Course Policies, in addition to official university-wide policies. DMS takes these policies very seriously and enforces them strictly.

AI: ***This course expects students to work without artificial intelligence (AI) assistance in order to better develop their skills in this content area. As such, AI usage is not permitted throughout this course under any circumstance.***

Grading Policy: The final grade in this course will be determined as follows:

Homework	15%
Presentation Project	15%
Midterm	35%
Final exam	35%

Your final letter grade will be based on curved scores.

Attendance Policy: Attendance at all classes will be recorded and is **mandatory**. Please make sure you read and fully understand the Math Department's Attendance Policy. This policy will be strictly enforced.

Religious Observance: NJIT is committed to supporting students observing religious holidays. Students must notify their instructors in writing of any conflicts between course requirements and religious observances, ideally by the end of the second week of classes and no later than two weeks before the anticipated absence.

Homework: Homework assignments are due within a week unless announced otherwise by the instructor. Late homework will not be accepted.

Exams: There will be one midterm exam held in class during the semester and one comprehensive final exam. Exams are held on the following days:

Midterm Exam	Mar 24, 2025
Final Exam Period	May 10 - May 16, 2025

Make sure you read and fully understand the Math Department's Examination Policy. This policy will be strictly enforced.

Makeup Exam Policy: There will be **NO MAKE-UP QUIZZES OR EXAMS** during the semester. In the event an exam is not taken under rare circumstances where the student has a legitimate reason for missing the exam, the student should contact the Dean of Students office and present written verifiable proof of the reason for missing the exam, e.g., a doctor's note, police report, court notice, etc. clearly stating the date AND time of the mitigating problem. The student must also notify the Math Department Office/Instructor that the exam will be missed.

Cellular Phones: All cellular phones and other electronic devices must be switched off during all class times.

ADDITIONAL RESOURCES

Further Assistance: For further questions, students should contact their instructor. All instructors have regular office hours during the week. These office hours are listed on the Math Department's webpage for Instructor Office Hours and Emails.

Accommodation of Disabilities: The Office of Accessibility Resources and Services (OARS) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you are in need of accommodations due to a disability please If you need an accommodation due to a disability please contact the Office of Accessibility Resources and Services at oars@njit.edu. The office is located in Kupfrian Hall, Room 201. A Letter of Accommodation Eligibility from the Office of Accessibility Resources and Services office authorizing your accommodations will be required.

For further information regarding self-identification, the submission of medical documentation and additional support services provided please visit the Office of Accessibility Resources and Services (OARS) website at:

https://www.njit.edu/accessibility/

Important Dates (See: Spring 2025 Academic Calendar, Registrar)

Date	Day	Event
January 21, 2025	Tuesday	First Day of Classes
January 27, 2025	Monday	Last Day to Add/Drop Classes
March 16, 2025	Sunday	Spring Recess Begins
March 22, 2025	Saturday	Spring Recess Ends
April 3, 2025	Thursday	Wellness day
April 7, 2025	Monday	Last Day to Withdraw
April 18, 2025	Friday	Good Friday - No Classes
April 20, 2025	Sunday	Easter Sunday - No Classes Scheduled
May 6, 2025	Tuesday	Thursday Classes Meet
May 7, 2025	Wednesday	Friday Classes Meet
May 7, 2025	Wednesday	Last Day of Classes
May 8, 2025	Thursday	Reading Day 1
May 9, 2025	Friday	Reading Day 2
May 10 - May 16, 2025	Friday to Thursday	Final Exam Period

Course Outline

Weeks	Section	Subject Topic
Week 1(1/22, 1/27)	*Chapter 2*	*Probability measures and their distributions*
Week 2(1/29, 2/3)	*Chapter 3*	*Random variables, Expectation, Independence*

Week 3(2/5, 2/10)	*Chapter 3*	*Random variables, Expectation, Independence (continued)*
Week 4(2/12, 2/17)	*Chapter 4*	*Various modes of stochastic convergence*
Week 5(2/19, 2/24)	*Chapter 4*	*The Borel—Cantelli lemma*
Week 6(2/26, 3/3)	*Chapter 4*	*Vague convergence*
Week 7(3/5, 3/10)	*Chapter 4*	*Vague convergence and uniform integrability*
	Spring Recess (No Class)	*3/16 to 3/22*
Week 9(3/12,3/24)	*Chapter 5*	*Convergence of series*
Week 10(3/26,3/31)	*Chapter 5*	*Laws of large numbers*
Week 11(4/2,4/7)	*Chapter 6*	*Characteristic functions*
Week 12(4/9, 4/14)	*Chapter 6*	*Characteristic functions*
Week 13(4/16, 4/21)	*Chapter 6*	*Characteristic functions*
Week 14(4/23, 4/28)	*Chapter 7*	*Liapounov's central limit theorem*
Week 15(4/30, 5/5)	*Chapter 7*	*Lindeberg-Feller central limit theorem*