NJIT New Jersey's Science & Technology University

THE COLLEGE OF SCIENCE AND LIBERAL ARTS

THE DEPARTMENT OF MATHEMATICAL SCIENCES

MATH 768: Probability Theory
Spring 2021 Graduate 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.

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. Subramanian

Office Hours for All Math Instructors: Spring 2021 Office Hours and Emails

Required Textbooks:

Title	*A Course in Probability Theory*
Author	Kai Lai Chung
Edition	2nd
Publisher	Academic Press
ISBN #	978-0121741518

University-wide Withdrawal Date:The last day to withdraw with a **W** is **Monday, April 5, 2021**. It will be strictly enforced.

COURSE GOALS

Course Objectives: This course will focus 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 ofthe 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, 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.

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

Homework	25%
Midterm Exams	40%
Final Exam	35%

Your final letter grade will be based on the following tentative curve.

A	86 - 100	**C+**	71 - 75
B+	81 - 85	**C**	66 - 70
B	76 - 80	**F**	0 - 65

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.

Homework Policy: Homework assignments are due within a week unless announced otherwise by 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 I	March 29, 2021
Final Exam Period	May 7 - 13, 2021

The final exam will test your knowledge of all the course material taught in the entire course. Make sure you read and fully understand the Math Department's Examination Policy. This policy will be strictly enforced.

Makeup Exam Policy: To properly report your absence from a midterm or final exam, please review and follow the required steps under the DMS Examination Policy found here:

- http://math.njit.edu/students/policies_exam.php

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

ADDITIONAL RESOURCES

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 contact Chantonette Lyles, Associate Director of Office of Accessibility Resources and Services at 973-596-5417 or via email at lyles@njit.edu. The office is located in Kupfrian Hall, Room 201. A Letter of Accommodation Eligibility from the Office of Accessibility Resources and Services 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/studentsuccess/accessibility/

Important Dates (See: Spring 2021 Academic Calendar, Registrar)

Date	Day	Event
January 19, 2021	T	First Day of Classes
January 23, 2021	S	Saturday Classes Begin
January 25, 2021	M	Last Day to Add/Drop Classes
March 14 - March 21, 2021	Su - Su	Spring Recess - No Classes
April, 2, 2021	F	Good Friday - No Classes
April 5, 2021	M	Last Day to Witdraw
May 4, 2021	T	Friday Classes Meet
May 4, 2021	T	Last Day of Classes
May 5 & May 6, 2021	W & R	Reading Days
May 7 - May 13, 2021	F - R	Final Exam Period

Course Outline

Week	Section	Topic
WEEK 1 1/25	Chapter 2	Probability measures and their distributions
WEEK 2 2/01	Chapter 3	Random variables, Expectation, Independence
WEEK 3 2/08	Chapter 3	Random variables, Expectation, Independence (continued)
WEEK 4 2/15	Chapter 4	Various modes of stochastic convergence
WEEK 5 2/22	Chapter 4	The Borel—Cantelli lemma

WEEK 6 3/01	Chapter 4	Vague convergence
WEEK 7 3/08	Chapter 4	Vague convergence and uniform integrability
Week of 3/22	**SPRING RECESS (NO CLASSES)**	
WEEK 9 3/19	Chapter 5	Convergence of series
WEEK 10 3/29	Chapter 5	Laws of large numbers
WEEK 11 4/05	Chapter 6	Characteristic functions
WEEK 12 4/12	Chapter 6	Characteristic functions
WEEK 13 4/19	Chapter 6	Characteristic functions
WEEK 14 4/26	Chapter 7	Liapounov's central limit theorem
WEEK 15 5/03	Chapter 7	The Lindeberg-Feller central limit theorem