MATH 433H: Mathematics and Financial Derivatives II - Honors
Spring 2024 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: Mathematical analysis of models encountered in the area of financial derivatives with emphasis on numerical methods. Topics include: Binomial Trees, Black Scholes Models, Finite Difference Methods.

Number of Credits: 3

Prerequisites: Corequisite: Math 340 with a grade of C or better. Math 432 with a grade of C or better.

Course-Section and Instructors:

Course-Section	Instructor
Math 433-H02	Professor A. Pole

Office Hours for All Math Instructors: Spring 2024 Office Hours and Emails

Required Textbook:

Title	*Derivatives Markets*
Author	McDonald
Edition	3rd
Publisher	Addison Wesley
ISBN #	978-0321543080

University-wide Withdrawal Date: The last day to withdraw with a **W** is **Monday, April 1, 2024**. It will be strictly enforced.

COURSE GOALS

Course Objectives

This course will teach students the mathematical models of arbitrage pricing for financial derivative contracts and the application of those models for risk management and hedging.

Course Outcomes

On successful completion of this course, the student will be able to:

- Describe the mathematical structure of regularly traded financial derivative securities, including European, American and exotic options.
- Describe and demonstrate risk neutral (arbitrage) pricing of derivative securities.
- Describe and demonstrate the analysis of the standard discrete and continuous time derivative security pricing models.

Course Assessment: Assessment of objectives is achieved through homework assignments, projects, and a comprehensive 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	20%
Project	60%
Final Exam	20%

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.

Projects: There will be 2 projects assigned during the semester.

- Binomial option pricing applications
- Black-Scholes option pricing applications

Exams: There will be a cumulative final exam during the final exam week:

Final Exam Period	May 3 - May 9, 2024

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: 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

Math Tutoring Center: Located in the Central King Building, Lower Level, Rm. G11 (See: Spring 2024 Hours)

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 2024 Academic Calendar, Registrar)

Date	Day	Event
January 16, 2024	Tuesday	First Day of Classes
January 22, 2024	Monday	Last Day to Add/Drop Classes
March 10, 2024	Sunday	Spring Recess Begins
March 16, 2024	Saturday	Spring Recess Ends
March 29, 2024	Friday	Good Friday - No Classes
April 1, 2024	Monday	Last Day to Withdraw
April 30, 2024	Tuesday	Friday Classes Meet
April 30, 2024	Tuesday	Last Day of Classes
May 1, 2024	Wednesday	Reading Day 1
May 2, 2024	Thursday	Reading Day 2

May 3 - May 9, 2024	Friday to Thursday	Final Exam Period

Course Outline

Week	Chapter	Topic
1		*Introduction & Overview:* *Derivative Securities; primary assets; Law of one price; no free lunch;* *Overview of derivatives pricing: arbitrage pricing, static & dynamic replication;* *Self-financing portfolio; Black Scholes Merton; risk-neutral/martingale pricing;* *[Professor supplied material]*
2 - 4	Chapter 10 & 11	*Binomial Option Pricing*
5 - 7	Chapter 20	*Brownian Motion and Itô's Lemma*
8 - 9	Chapter 12	*Black-Scholes Option Pricing*
10 - 11	Chapter 13	*Delta Hedging*
12 - 13	Chapter 14	*Exotic Options*
14	Chapter 24	*Interest Rate Models*

Updated by Professor A. Pole - 01/03/2024
Department of Mathematical Sciences Course Syllabus, Spring 2024