MATH 451H: Methods of Applied Mathematics II (Capstone II)
Spring 2022 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: Small teams of students conduct research projects under the guidance of faculty members who perform applied research. Effective From: Spring 2009.

Number of Credits: 3

Prerequisites: Math 450H with a grade of C or better.

Course-Section and Instructors:

Course-Section	Instructor
Math 451-H02	Professor L. Kondic

Office Hours for All Math Instructors: Spring 2022 Office Hours and Emails

Course Materials:

Basic Literature (will be provided by the instructor);

- 1. D. P. Landau, K. Binder: A Guide to Monte-Carlo simulations in Statistical Physics, 3rd edition, 2009
- 2. D. J. Acheson, Elementary Fluid Dynamics, 2005
- 3. K. W. Morton and D. Mayers, Numerical Solution of Partial Differential Equations, 2nd edition, 2005
- Additional literature involving selected research papers will be also provided by the instructor.

University-wide Withdrawal Date: The last day to withdraw with a **W** is **Monday, April 4, 2022**. It will be strictly enforced.

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:

Projects and Presentations	70%
Final Report and Presentation	30%

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.

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 2022 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 contact Scott Janz, Associate Director of Disability Support Services at 973-596-5417 or via email at scott.p.janz@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/studentsuccess/accessibility/

Important Dates (See: Spring 2022 Academic Calendar, Registrar)

Date	Day	Event
January 18, 2022	Tuesday	First Day of Classes
January 22, 2022	Saturday	Saturday Classes Begin
January 24, 2022	Monday	Last Day to Add/Drop Classes
March 14, 2022	Monday	Spring Recess Begins
March 19, 2022	Saturday	Spring Recess Ends
April 4, 2022	Monday	Last Day to Withdraw
April 15, 2022	Friday	Good Friday - No Classes
April 17, 2022	Sunday	Easter Sunday - No Classes
May 3, 2022	Tuesday	Friday Classes Meet
May 3, 2022	Tuesday	Last Day of Classes

May 4 - May 5, 2022	Wednesday and Thursday	Reading Days
May 6 - May 12, 2022	Friday to Thursday	Final Exam Period

Course Outline

Project 1: Modeling frost propagation on microstructured surfaces

- Interact with experimental researchers to understand the state-of-the-art and relevance of frost spreading in applications
- Review the literature to understand the basic mathematical models involved in frost spreading: heat diffusion, phase change, mass transfer
- Develop appropriate continuum models for frost spreading on microstructured surfaces
- Based on continuum models, develop discrete Monte-Carlo type of simulations for frost spreading
- Compare the results of Monte-Carlo simulations to the experimental ones and improve the theoretical model as needed

Project 2: Modeling the influence of acoustics on spreading of thin fluid films

- Interact with experimental researchers to understand the state-of-the art of recent acoustowetting experiments
- Review the literature to understand the basic mathematical models involved in interaction of acoustics and fluid dynamics
- Develop appropriate models describing recent experiments involving spreading of oil/water films under applied acoustic field
- Develop numerical codes needed to solve relevant partial differential equations describing the influence of acoustic field on spreading of oil/water films
- Compare the results of numerical simulations with the experimental ones and work on improving the theoretical and computational models as needed