

THE DEPARTMENT OF MATHEMATICAL SCIENCES

MATH 451H: Methods of Applied Mathematics II (Capstone II) *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.

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-H04	Professor S. Afkhami

Office Hours for All Math Instructors: [Spring 2024 Office Hours and Emails](#)

Course Materials:

- References and literature will be provided by the instructor
- Research articles and course notes will be uploaded on Canvas

University-wide Withdrawal Date: The last day to withdraw with a W is **Monday, April 1, 2024**. 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	50%
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Final Report and Presentation	50%
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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 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	Final Exam Period

	Thursday	
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PROJECTS

1. Derivation of a mathematical model for the dynamics of drop impact on a solid surface and the development of a numerical framework for the solution of the mathematical model
2. Derivation of a mathematical model for the solidification of impacting drops on a solid substrate and the development of a numerical framework for the solution of the mathematical model
3. Carrying out experiments to study parameters controlling solidification of molten wax droplets falling on a solid surface
4. Carrying out a detailed comparison of the experimental results with the theoretical/numerical results

COURSE OUTLINE

Week 1-2: An energy balance approach of the dynamics of drop impact on a solid surface
 Week 3-6: Numerical method for the solution of Stefan problem and the solidification dynamics
 Week 4-10: Laboratory experiments for the impact and solidification of molten wax droplets on a solid surface
 Week 11-12: Combining the impact and freezing mathematical models for the impacting of molten wax droplet on different cold substrates
 Week 12-13: Comparison between theoretical, numerical, and experimental results
 Week 14: Preparation of final report
 Week 15: Final presentations

*Updated by Professor S. Afkhami - 12/8/2023
 Department of Mathematical Sciences Course Syllabus, Spring 2024*