NJIT
New Jersey's Science &
Technology University

**THE COLLEGE OF SCIENCE
AND LIBERAL ARTS**

THE DEPARTMENT OF MATHEMATICAL SCIENCES

MATH 451-H02: Methods of Applied Mathematics II (Capstone II)
Spring 2020 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 S. Afkhami

Office Hours for All Math Instructors: Spring 2020 Office Hours and Emails

Course Materials:

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 6, 2020**. 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%
Final Report	50%

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 2020 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.

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

Accommodation of Disabilities: Disability Support Services (DSS) 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 Disability Support 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 Disability Support 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 Disability Support Services (DSS) website at:

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

Important Dates (See: Spring 2020 Academic Calendar, Registrar)

Date	Day	Event
January 21, 2020	T	First Day of Classes
January 31, 2020	F	Last Day to Add/Drop Classes
March 15 - 22, 2020	Su-Su	Spring Recess: No Classes/ University Open
April 6, 2020	M	Last Day to Withdraw
April 10, 2020	F	Good Friday - University Closed
May 5, 2020	T	Friday Classes Meet - Last Day of Classes
May 6 & 7, 2020	W & R	Reading Days
May 8 - 14, 2020	F - R	Final Exam Period

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 molten wax droplets on a solid substrate 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 3-4: Numerical method for the solution of nonlinear second-order variable-coefficient ordinary differential equation

Week 5-6: Stefan problem and the solidification dynamics

Week 7-8: Finite difference/Finite volume methods for the solution of the moving boundary problem

Week 9-10: Laboratory experiments for the impact and solidification of molten wax droplets a solid surface

Week 11: Combining the impact and freezing mathematical models for the processes of a molten wax droplet impact on different cold substrates

Week 12-13: Comparison between theoretical, numerical, and experimental results

Week 14: Preparation of final report

Week 15: Final presentations