

THE DEPARTMENT OF MATHEMATICAL SCIENCES

## MATH 712: Numerical Methods II

### *Fall 2025 Course Syllabus*

**NJIT Academic Integrity Code:** Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: NJIT Academic Integrity Code.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu

### COURSE INFORMATION

**Course Description:** Numerical methods for the solution of initial- and boundary-value problems for partial differential equations, with emphasis on finite difference methods. Consistency, stability, convergence, and implementation are considered.

**Number of Credits:** 3

**Prerequisites:** MATH 614, MATH 331 or departmental approval, and proficiency in a computer programming language (MATLAB, C, C++, Fortran, etc.)

**Course-Section and Instructors:**

Course-Section	Instructor
Math 712-001	Professor W. Choi

**Office Hours for All Math Instructors:** Fall 2025 Office Hours and Emails

**Required Textbook:** There is no required textbook for this class. We will use resources from several resources, including

1. *Finite Difference Methods for Ordinary and Partial Differential Equations: Steady-State and Time-Dependent Problems*, Randall J. LeVeque, SIAM.
2. *Numerical Partial Differential Equations: Finite Difference Methods*, J. W. Thomas, Springer.
3. *Numerical Analysis of Spectral Methods*, D. Gottlieb & S. A. Orszag, SIAM

**University-wide Withdrawal Date:** The last day to withdraw with a M is **Monday, November 10, 2025**. 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:

Homework	40%
Midterm Exam	30%
Final Project	30%

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

A	88 - 100	C	61 - 65
B+	81 - 87	D	51 - 60
B	71 - 80	F	0 - 50
C+	66 - 70		

**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.

**Religious Observance:** NJIT is committed to supporting students observing religious holidays. Students must notify their instructors in writing of any conflicts between course requirements and religious observances, ideally by the end of the second week of classes and no later than two weeks before the anticipated absence.

**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	TBA
Final Exam	December 14 - December 20, 2025

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

**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](mailto: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: [Fall 2025 Academic Calendar, Registrar](#))

Date	Day	Event
September 1, 2025	Monday	Labor Day
September 2, 2025	Tuesday	First Day of Classes
September 8, 2025	Monday	Last Day to Add/Drop Classes
November 10, 2025	Monday	Last Day to Withdraw
November 25, 2025	Tuesday	Thursday Classes Meet
November 26, 2025	Wednesday	Friday Classes Meet
November 27 to November 30, 2025	Thursday to Sunday	Thanksgiving Recess - Closed
December 11, 2025	Thursday	Last Day of Classes
December 12, 2025	Friday	Reading Day 1
December 13, 2025	Saturday	Saturday Classes Meet
December 14 to December 20, 2025	Sunday to Saturday	Final Exam Period

## Course Outline

	Topics
1	Introduction to finite difference approximations
2	Truncation errors, stability, consistency, convergence
3	FD schemes for hyperbolic PDEs
4	Von Neumann stability analysis, CFL condition
5	Numerical dispersion and dissipation of finite difference schemes
6	FD scheme for Parabolic PDEs
7	FD schemes for Elliptic PDEs
8	Discrete Fourier Series and Pseudo-spectral Methods for PDEs
9	Applications to nonlinear PDEs

*Updated by Professor W. Choi - 2025  
Department of Mathematical Sciences Course Syllabus, Fall 2025*