MATH 340: Applied Numerical Methods
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: Introduction to numerical methods with emphasis on mathematical models. Implements and investigates numerical techniques for the solution of linear and nonlinear systems of equations, eigenvalue problems, interpolation and approximation, techniques of optimization, Monte Carlo methods, and applications to ordinary differential equations and integration.

Number of Credits: 3

Prerequisites: MATH 211 with a grade of C or better or MATH 213 with a grade of C or better, and CS 100 with a grade of C or better or CS 101 with a grade of C or better or CS 113 with a grade of C or better or CS 115 with a grade of C or better or MATH 240 with a grade of C or better.

Course-Section and Instructors:

Course-Section	Instructor
Math 340-001	Professor V. Matveev

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

Recommended Textbook:

Title	*Numerical Analysis*
Author	Timothy Sauer
Edition	3rd
Publisher	978-0134696454
ISBN #	Pearson

University-wide Withdrawal Date: The last day to withdraw with a **W** is **Monday, November 10, 2025**. It will be strictly enforced.

Course Outcomes

Students will demonstrate the ability to:

- Analyze errors arising in numerical computation of solutions to mathematical and applied problems.
- Apply numerical techniques to compute approximate solutions of nonlinear equations and differential equations and analyze error issues.
- Apply numerical techniques for interpolation, differentiation and quadrature problems and analyze error issues.
- Communicate advantages and disadvantages of various numerical techniques and select appropriate numerical methods to solve specific problems.
- Translate numerical problems and methods into computational algorithms, apply the algorithms and develop conclusions from the output.

Course Assessment: The assessment of outcomes will be achieved through homework, MATLAB assignments, quizzes, and exams.

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	14%
Lab assignments	14%
Quizzes	16%
Midterm Exam	25%
Final Exam	30%

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

A	90 - 100	**C**	60 – 67
B+	82 - 89	**D**	53 - 59
B	75 - 81	**F**	52 and below
C+	68 – 74		

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.

Homework and Lab assignments: Homework and lab assignments REQUIRE use of MATLAB software. Credit for homework solutions will be given based on justified and legible solutions: answers without solutions or poorly legible solutions will receive no credit.

Quizzes: Short quizzes will be given about once a week at start of class on a pre-announced topic.

Policy on use of AI tools: Artificial Intelligence (AI) has great pedagogical potential and may help students understand course material, providing a useful additional resource when learning methods to prepare for exams, solve homework problems and complete lab assignments. However, students may ***not*** copy ***any*** part of AI output without modification to complete assignments: by submitting your work, you are testifying that you are submitting your own work, and may be asked to explain your solution by your instructor before the grade for a given assignment is finalized. As the exams are in person and without use of electronic resources, the use of AI is not relevant for the exams as planned.

Exams: There will be four exams during the semester and a final exam during the final exam week. The tentative dates are:

Midterm Exam I	October 23, 2025
Final Exam Period	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

Math Tutoring Center: Located in the Central King Building, Lower Level, Rm. G11 (See: Fall 2025 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 need an accommodation due to a disability, please contact the Office of Accessibility Resources and Services at oars@njit.edu, or visit Kupfrian Hall 201 to discuss your specific needs. A Letter of Accommodation Eligibility from the office authorizing student accommodations is 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: 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 27-30, 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 14-20, 2025	Sunday to Saturday	Final Exam Period

Course Outline

Date	Lecture	Section(s)	Topic
9/2	1	0.5	Introduction; review of Calculus topics (IVT, MVT, Taylor series)
9/4	2	0.2-0.3	Binary number system and floating-point number representation
9/5	Lab 1	0.5	Lab session 1: MATLAB basics & Taylor series
9/9	3	0.3	IEEE double precision standard for floating-point numbers
9/11	4	0.1, 0.4	Loss of significance; evaluating a polynomial
9/12	Lab 2	0.4	Lab session 2: Loss of significance
9/16	5	1.1	Root-finding: the bisection method
9/18	6	1.2	Fixed-point iteration
9/19	Lab 3	1.2	Lab session 3: Fixed-point iteration
9/23	7	1.3	Forward vs backward error; sensitivity of solution
9/25	8	1.4	Newton's method and Its error
9/26	Lab 4	1.4	Lab 4: Newton's method
9/30	9	1.5	Root-finding w/o derivatives: secant method & *regula falsi*
10/3	Lab 5	1.5	Lab session 5: Root-finding without derivatives
10/7	10	4.1	Least Squares approximation
10/9	11	4.2	Least Squares approximation: additional methods
10/10	Lab 6	4.1-4.2	Lab session 6: Least-squares approximation
10/14	12	3.1	Polynomial Interpolation; Lagrange polynomials
10/16	13	3.2	Polynomial Interpolation; Newton's divided differences
10/17	Lab 7	3.1	Lab session 8: Polynomial interpolation using Lagrange basis
10/21	**14**	**Review for Midterm Exam**	
10/23	**15**	**Midterm Exam**	
10/24	Lab 8	3.2	Lab session 8: Polynomial interpolation & Newton's differences
10/28	16	3.3	Chebyshev polynomials
10/30	17	3.4	Cubic splines
10/31	Lab 9	3.3-3.4	Lab session 9: Chebyshev polynomials and cubic splines
11/4	18	5.1	Numerical differentiation

11/6	19	5.2	Numerical integration
11/7	Lab 10	5.1-5.2	Lab session 10: Numerical differentiation and integration
11/11	20	5.3	Romberg Integration and Richardson extrapolation
11/13	21	5.5	Gaussian Quadrature
11/14	Lab 11	5.5	Lab session 11: Numerical integration & Gaussian quadrature
11/18	22	6.1	ODEs: Euler's method
11/20	23	6.2	ODEs: Taylor series Methods
11/21	Lab 12	6.1-6.2	Lab session 12: Euler and Taylor series methods
11/25	24	6.4	ODEs: Runge Kutta methods
11/26	Lab 13	6.4	Lab session 13: Runge Kutta methods
12/2	25	6.3	Systems of ODEs
12/4	26	6.6	Stability of single-step methods
12/5	Lab 14	6.3	Lab session 14: Systems of ODEs
12/9	27	6.7	ODEs: Multi-step methods and stability
12/11	28	Review for Final Exam	
12/14-12/20	FINAL EXAM WEEK		

Updated by Professor V. Matveev - 2025
Department of Mathematical Sciences Course Syllabus, Fall 2025