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Fall 2019

# MATH 611-101: Numerical Methods for Computation

Y-N. Young

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## MATH 611: Numerical Methods for Computation

### *Fall 2019 Graduate 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:** This course provides a practical introduction to numerical methods. Numerical solution of linear systems. Interpolation and quadrature. Iterative solution of nonlinear systems. Computation of eigenvalues and eigenvectors. Numerical solution of initial and boundary value problems for ODE's. Introduction to numerical solution of PDE's. Applications drawn from science, engineering, and finance.

**Number of Credits:** 3

**Prerequisites:** Calculus I, II, III; Differential Equations and Linear Algebra.

**Course-Section and Instructors**

Course-Section	Instructor
Math 611-101	Professor Y.-N. Young

**Office Hours for All Math Instructors:** [Fall 2019 Office Hours and Emails](#)

**Required Textbooks:**

<b>Title</b>	<i>Spectral Methods in MATLAB</i>
<b>Author</b>	Trefethen
<b>Edition</b>	---
<b>Publisher</b>	SIAM
<b>ISBN #</b>	978-0898714654 or 978-0898719598

ExtraInfo

**University-wide Withdrawal Date:** The last day to withdraw with a W is **Monday, November 11, 2019**. It will be strictly enforced.

### COURSE GOALS

Learning Outcomes

- Analyze errors arising in numerical computation of solutions to mathematical and applied problems
- Apply numerical techniques to find solutions of nonlinear equations, linear systems of equations and differential equations.
- Apply numerical techniques for interpolation, differentiation and quadrature problems.
- Communicate advantages and disadvantages of various numerical techniques and select appropriate numerical methods for specific problems.

## 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	50%
Midterm Exam	20%
Final Exam	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.

**Homework Policy:** Homework assignments will require use of MATLAB software.

**Exams:** There will be one midterm exam held in class during the semester and one comprehensive final exam. The final exam will be held during the following week:

Midterm Exam	Lecture 8 (October 25, 2019)
Final Exam Week	December 14 - 20, 2019

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:** To properly report your absence from a midterm or final exam, please review and follow the required steps under the DMS Examination Policy found here:

- [http://math.njit.edu/students/policies\\_exam.php](http://math.njit.edu/students/policies_exam.php)

**Cellular Phones:** All cellular phones and other electronic devices must be switched off during all class times.

## ADDITIONAL RESOURCES

**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](mailto:lyles@njit.edu). The office is located in Fenster Hall, Room 260. 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: [Fall 2019 Academic Calendar, Registrar](#))

Date	Day	Event
September 3, 2019	T	First Day of Classes
September 13, 2019	F	Last Day to Add/Drop Classes
November 11, 2019	M	Last Day to Withdraw
November 26, 2019	T	Thursday Classes Meet
November 27, 2019	W	Friday Classes Meet
November 28-29, 2019	R-F	Thanksgiving Recess
December 11, 2019	W	Last Day of Classes
December 12, 13 2019	R & F	Reading Days
December 14-20, 2019	F - R	Final Exam Period

## Course Outline

Lecture	Section	Topic	Assignment
1 (09/05)	Chapter 0 and 1	Calculus Review, Foundations of Numerical Analysis and Introduction to Rootfinding	See Course Website
2 (09/12)	Chapter 2	Rootfinding for nonlinear equations	See Course Website
3 (09/19)	Chapter 2 and 10	Rootfinding for nonlinear equations	See Course Website
4 (09/26)	Chapter 6	Linear systems of equations	See Course Website
5 (10/03)	Chapters 6 and 7	Linear systems of equations Eigenvalues and eigenvectors	See Course Website
6 (10/10)	Chapter 3	Interpolation	See Course Website
7 (10/17)	Chapter 8	Least Squares	See Course Website
8 (10/25)		<b>MIDTERM EXAM</b>	
9 (11/07)	Chapter 4	Differentiation and Integration	See Course Website
10 (11/14)	Chapter 4	Differentiation and Integration	See Course Website
11 (11/21)	Chapter 5	Ordinary Differential Equations - Initial Value Problems	See Course Website
12 (12/05)	Chapter 5	Ordinary Differential Equations - Initial Value Problems	See Course Website
13 (12/12)	Chapter 11	Ordinary Differential Equations - Initial Value Problems and Boundary Value Problems	See Course Website
14		Miscellaneous Topics	See Course

*Updated by Professor Y.-N. Young - 9/13/2019  
Department of Mathematical Sciences Course Syllabus, Fall 2019*

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