

# Course Syllabus

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## Spring 2026

24679/003512  
29501/003512

## Math/CS 4334

Math/CS 4334.001  
Math/CS 4334.002

MW 11:30am-12:45pm  
MW 1:00pm - 2:15pm

## Numerical Analysis

AD 2.232  
CB 1.206

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### Instructor Information

Instructor: Dr. Bentley Garrett  
Office: FA 2.406  
Phone: 972-883-4236

E-mail: [btg032000@utdallas.edu](mailto:btg032000@utdallas.edu)  
Campus Mail: Mail Stop FO 35  
Office hours: MW 5:30-7:00pm, or by appointment

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### Course Pre-requisites, Co-requisites, and/or Other Restrictions

Prerequisites: (MATH 2370 or CS 1324 or CS 1325 or CE 1337 or CS 1337) and (MATH 2418 and MATH 2451 or MATH 3351).

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### Course Description

Solution of linear equations, roots of polynomial equations, interpolation and approximation, numerical differentiation and integration, solution of ordinary differential equations, computer arithmetic, and error analysis.

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### Student Learning Objectives/Outcomes

- 1) Students are able to describe fundamental concepts and procedures in mathematics and their applications. (Basic Concepts).
  - 2) Apply formal mathematical arguments in analysis, model creation, justification of computational procedures (Advanced Concepts).
  - 3) Application of mathematics in other fields and working knowledge of computational packages such as MATLAB. (Software Application)
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### Textbooks and Materials

**Text:** *Numerical Analysis, Third Edition*, by Timothy Sauer, Pearson  
e-book: ISBN-13: 9780134697376  
Loose leaf: ISBN-13: 9780134697338  
Hard cover: ISBN-13: 9780134696454

**Note:** *Numerical Analysis, Second Edition*, by Timothy Sauer, Pearson, would also be sufficient.

**MATLAB software:** MATLAB will be used for all programming assignments. If you do not already have one, you will need to set up a MATLAB license here:

<https://www.mathworks.com/academia/tah-portal/university-of-texas-dallas-706581.html>

This license will enable you to do two things:

- 1) Download the MATLAB software package on your own computer for free (instructions also given on the above website).
- 2) Using your MATLAB license username/password, you will also be able to login to the website, <https://grader.mathworks.com/> (MATLAB Grader) which will give you access to the course, **Math 4334 SP26**, where you will complete all of your programming assignments. **An email with a link will soon be sent to you where you will access this MATLAB Grader course for the first time; for subsequent times, there will also be a link in the eLearning course, referenced below.**

**Note:**

- **In order to access the MATLAB Grader course, Math 4334 SP26, for the first time, you MUST use the link that will be emailed to you. Note that it might end up in your junk email!**
- You can use the MATLAB software package that you download (item 1) to practice on your programming assignments, if you wish, but all programs will ultimately be submitted on <https://grader.mathworks.com/>.

- Also, submitted programs may be compared using software that detects similarities. You may help one another on the assignments, but the final submitted code should be yours and not a copy of another code (or a copy with only variable changes, etc.)
- Free access to MATLAB is also available in the campus computer labs: see <https://oit.utdallas.edu/about/client-services/labs/> for details.)

**eLearning:** <http://elearning.utdallas.edu> You must enter your NETID username and password to logon to eLearning. You will need to access the course: **MATH 4334.001(002)- S26** or **CS 4334.001(002)- S26**. Here, you will find the syllabus, assignments, handouts, etc., as well as a record of your grades. Any messages/emails concerning the class will also appear on eLearning (and your UTD email account).

**Calculators:** On occasion, a scientific calculator will be needed on exams. Graphing calculators, programmable calculators, calculators with non-numeric displays, or any calculators that perform calculus operations are not allowed on exams.

**Suggested Course Materials/Additional Resources**

**Student Solutions Manual** - may also be available

**Further MATLAB references:**

- 1) *Mastering MATLAB*, by Hanselman and Littlefield. Publisher: Prentice Hall, Inc.
- 2) *Essentials of MATLAB Programming* by Chapman. Publisher: Thomson.

**Assignments & Academic Calendar (subject to change)**

<b>Topics:</b>	<b>Relevant Chapters/Sections in Sauer Text:</b>
Section 1: Computer Arithmetic and Error Analysis	Chapter 0: 0.1-5
Section 2: Roots of Nonlinear Equations	Chapter 1: 1.1-5
Section 3: Systems of Linear/Nonlinear Equations	Chapter 2: 2.1-5, 2.7
Section 4: Interpolation and Approximation	Chapter 3: 3.1-4
Section 5: Numerical Differentiation and Integration	Chapter 5: 5.1-3
Section 6: Solution of Ordinary Differential Equations	Chapter 6: 6.1-3, 6.6, 7.1-2

**Tentative schedule is below. Also, note that “SM” means “Supplementary Material” not in text. SM notes will be posted in eLearning within the lecture notes.**

Week	M		W	
1	1/19	<b>MLK Day</b>	1/21	Introduction, Sec. 1 Horner’s Method 2 <sup>nd</sup> ed:p.1-7; 3 <sup>rd</sup> ed: p.1-7
2	1/26	Sec.1 Binary/Hex Numbers, Floating-Point Numbers, Error/Accuracy 2 <sup>nd</sup> ed:p. 8-13 ; 3 <sup>rd</sup> ed: p.8-14 <b>Post HW1</b>	1/28	Sec.1 Error Propagation and Floating-Point Arithmetic SM
3	2/2	Sec.1 Swamping, Loss of Significance, Stability vs. Conditioning 2 <sup>nd</sup> ed:p.16-18,SM; 3 <sup>rd</sup> ed: p.17-20,SM	2/4	Sec.2 Bisection Method/Theorem, Rate/Order of Convergence, Global/Local Convergence 2 <sup>nd</sup> ed:p.19-20,25-29,SM ; 3 <sup>rd</sup> ed: p.21-2,27-31,SM
4	2/9	Sec.2 Method of False Position, Fixed Point Iteration:Existence/Uniqueness of Fixed Points, Fixed Point Theorem 2 <sup>nd</sup> ed:p.62-3,20,31-40,SM 3 <sup>rd</sup> ed: p.66-7,22,33-43,SM <b>HW1due, Post HW2</b>	2/11	Sec.2 Fixed Point Iteration (cont’d), Conditioning of a Root, Forward/Backward Error 2 <sup>nd</sup> ed:p.31-40(cont’d),43-47,SM 3 <sup>rd</sup> ed: p.33-43(cont’d),46-9,SM

5	2/16	Sec.2 Newton's Method, Secant Method 2 <sup>nd</sup> ed:p.21-2,51-58,61-2,SM 3 <sup>rd</sup> ed: p.23,54-61,64-5,SM <b>Return HW1</b>	2/18	Sec.3 Linear Systems: Review, Gaussian Elimination, Complexity, LU Factorization 2 <sup>nd</sup> ed:p.71-84,SM ; 3 <sup>rd</sup> ed: p.74-88,SM
6	2/23	Sec.3 Linear Systems (cont'd), LU Factorization, Stability: Gaussian Elimination with Partial Pivoting 2 <sup>nd</sup> ed: p.71-78(cont'd),79-84,SM,p.91-101 3 <sup>rd</sup> ed: p.74-81(cont'd),82-8,SM,p.95-105 <b>HW2 due, Post HW3</b>	2/25	Sec.3 Conditioning: Vector/Matrix Norms, Condition Number 2 <sup>nd</sup> ed:p.85-91; 3 <sup>rd</sup> ed: p.89-95
7	3/2	Sec.3 Iterative Methods: Jacobi and Gauss-Siedel Iteration, Multivariate Newton's Method 2 <sup>nd</sup> ed:p.106-109,130-133 3 <sup>rd</sup> ed: p.110-14,136-9 <b>Return HW2</b>	3/4	<b>TBD</b>
8	3/9	<b>Exam 1</b>	3/11	Sec.4 Interpolation: Lagrange Polynomial, Interpolation (Uniqueness) Theorem, Newton's Polynomial 2 <sup>nd</sup> ed:p.138-141; 3 <sup>rd</sup> ed: p.144-7
9	3/16	<b>Spring Break</b>	3/18	<b>Spring Break</b>
10	3/23	Sec.4 Newton's Polynomial (cont'd), Higher-Degree Interpolants, Interpolation Error 2 <sup>nd</sup> ed:p.141-146,151-2 ; 3 <sup>rd</sup> ed: p.147-53,157-8 <b>Post HW4</b>	3/25	Sec.4 Interpolation Error (cont'd), Chebyshev Nodes/Polynomials 2 <sup>nd</sup> ed:p.152-3,(154-5),155-63 3 <sup>rd</sup> ed: p.159,(161-2),162-70 <b>HW3 due</b>
11	3/30	Sec.4 Splines: Linear, Quadratic, Cubic SM	4/1	Sec.4 Cubic Splines (cont'd) 2 <sup>nd</sup> ed:p.166-76 ; 3 <sup>rd</sup> ed: p.173-183 <b>Return HW3</b>
12	4/6	Sec.5 Numerical Differentiation and Error Analysis, Truncation vs. Roundoff Error 2 <sup>nd</sup> ed:p.243-249; 3 <sup>rd</sup> ed: p.253-8	4/8	Sec.5 Richardson Extrapolation, Numerical Integration: Closed Newton-Cotes Formulas (Trapezoid Rule, Simpsons' Rule) 2 <sup>nd</sup> ed:p.249-250,22,254-57 3 <sup>rd</sup> ed: p.259-60,23,264-7 <b>HW4 due, Post HW5</b>
13	4/13	Sec.5 N-C Formulas (cont'd): Simpson's 3/8 Rule, Error Analysis/Degree of Precision, Composite N- C Formulas 2 <sup>nd</sup> ed:p.257-61; 3 <sup>rd</sup> ed: p.267-71	4/15	Sec.5 Composite N-C Formulas (cont'd), Error Analysis 2 <sup>nd</sup> ed:p.261-2 ; 3 <sup>rd</sup> ed: p.271-2 <b>Return HW4</b>
14	4/20	<b>TBD</b>	4/22	<b>Exam 2</b>
15	4/27	Sec.6 Differential Equations: Introduction, Separable Equations, Initial Value Problems, Existence/Uniqueness Theorem 2 <sup>nd</sup> ed:p.281-83,287-89; 3 <sup>rd</sup> ed: p.293-5,299-301	4/29	Sec.6 Numerical Methods: Euler's Method, Local Truncation/Global Errors 3 <sup>rd</sup> ed: p.295-300,302,306-10,347-8,SM 2 <sup>nd</sup> ed:p.283-87,289-90,293-297,332-3,SM <b>HW5 due, Post HW6</b>

16	5/4	Sec.6 Stability: Implicit (Backward) Euler’s Method, General Taylor’s Series Methods, “Integration” Methods: Implicit/Explicit Trapezoid Method 2 <sup>nd</sup> ed:p.333-5,342,297-301,SM 3 <sup>rd</sup> ed: p.348-50,359,310-14,SM	5/6	<b>TBD</b> (options: Numerical Methods for Higher-Order ODEs: First-Order Systems and Euler’s Method for IVPs, Finite Difference Method for BVPs) (options: Sec. 6, 2 <sup>nd</sup> ed:p.303-5,349-51,357-63 3 <sup>rd</sup> ed: p.316-18,367-70,376-82) <b>Return HW5, HW6</b> <b>Theoretical due, HW6 MATLAB Grader due date TBD</b>
17	5/11	<b>No Class</b>	5/13	<b>No Class</b>
		<b>Final Exam</b> <b>Math/CS 4334.001: TBD</b> <b>Math/CS 4334.002: TBD</b>		

## Homework Assignments

Homework will consist of both a theoretical component (15%) and computational component using MATLAB (15%). Assignments will be posted at least every two weeks, and due dates will be shown on the assignment. You will be notified by UTD email and eLearning announcements when an assignment is posted.

Theoretical assignments will be posted in eLearning, will be handwritten, and will be submitted in eLearning. Problems on each theoretical assignment may be randomly graded. You may help one another on the theoretical problems, but the final product should be yours, and not a copy of others’ problems, or parts of problems.

Programming assignments will be submitted in MATLAB Grader, which is set up so that you can rerun the programs until a selected set of test variables are correct. These are the variables that will be graded by MATLAB Grader. You can rerun and retest your programs as many times as you like before the indicated deadline. The number of actual submissions may be limited. The scores on the problems will be averaged to compute the score for each MATLAB assignment.

The lowest theoretical assignment grade will be dropped and the remaining grades will be used to compute the theoretical HW average referenced below; the lowest MATLAB assignment grade will also be dropped and the remaining grades will be used in the MATLAB HW average referenced below. Late HW will NOT be accepted – just submit what you have completed on the due date. This is one reason why one assignment of each category will be dropped.

Please double-check these withdrawal dates on [www.utdallas.edu](http://www.utdallas.edu):

1/20-2/4	Students may withdraw from a class without record.
2/5-4/8	Students may withdraw from a class with approval and receive a W.
4/9–EOT	Students may withdraw from a class for non-academic reasons only.

## Grading Policy

Theoretical HW Average	15%
MATLAB HW Average	15%
Exam 1	20%
Exam 2	20%
Final Exam	30%

Grade Scale	[96.6,100]...A+	[93.3,96.6).....A	[90,93.3).....A-
	[86.6,90).....B+	[83.3,86.6).....B	[80,83.3).....B-
	[76.6,80).....C+	[73.3,76.6).....C	[70,73.3).....C-
	[66.6,70).....D+	[63.3,66.6).....D	[60,63.3).....D-
	[0,60).....F		

## Course & Instructor Policies

Exams/assignments:

- You will be notified of the due dates when the assignments are given. Late HW will NOT be accepted – just submit what you have completed on the due date.
- I will accept handwritten assignments as long as they are neat and well-organized with problems in the correct order.
- There will be no make-up exams.

- (d) Exams are closed book and with only scientific calculators. I may allow you to bring one 8 1/2 X 11 sheet of notes.
- (e) SHOW ALL WORK on exams and assignments. Unsupported answers are considered miracles and, while inspirational, will receive little or no credit. Midterm exams and assignments will be returned to you as soon as possible. Any document not picked up by the end of finals week will be destroyed.
- (f) Final exams are not returned to the student but are held for review for one year.
- (g) It is essential that you attend all lectures to be successful in this class.
- (h) There will be **no** extra credit

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**Academic Conduct:**

Academic dishonesty is taken very seriously and will not be tolerated in this class in any form. Academic misconduct includes willfully cheating on or giving aid during an exam or copying homework assignments (from the web, from each other, or from a solutions manual). Blatant copying on an exam, homework assignment, or computer assignment may result in a grade of zero for that work. You are encouraged to discuss the homework assignments with other students in the class. However, it is expected that the homework you submit for grading will be written up by you alone (this includes computer programs which must not be duplicates of programs other students turn in). Further information on the academic conduct policy can be found at <http://www.utdallas.edu/deanofstudents/dishonesty/>

**Citizenship:**

Any action that disturbs your classmates or interrupts the lecture is unacceptable. Examples of such actions are:

- (a) Entering the classroom late - be as punctual as possible.
- (b) Leaving the classroom before break or before the end of lecture.
- (c) Cell phones, ringers, buzzers, beepers, alarms - turn them off! - unless you are a member of an emergency response team.
- (d) Student participation in class is desired, however, please raise your hand to speak and avoid having side conversations with your classmates.

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**Comet Creed**

*This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same: "As a Comet, I pledge honesty, integrity, and service in all that I do."*

**UT Dallas Syllabus Policies and Procedures**

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus. Please go to <http://go.utdallas.edu/syllabus-policies> for these policies.

*The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.*