

SYLLABUS

MATH 4364

INTRODUCTION TO NUMERICAL ANALYSIS IN SCIENTIFIC COMPUTING FALL 2021

Instructor: Alexander Mamonov
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Classroom: SEC 202
Class hours: TuTh 4:00PM – 5:30PM
Class number: 18549

The information contained in this class syllabus is subject to change without notice. Students are expected to be aware of any additional course policies presented by the instructor during the course.

All class policies, announcements, lecture notes, reviews, homework assignments, solutions, and grades are posted on **Blackboard:** <http://elearning.uh.edu/webapps/portal/frameset.jsp>

Prerequisite: MATH 3321 or MATH 3331 and an ability to perform computer assignments in Matlab or GNU Octave.

Reference R.L. Burden & J.D. Faires,
Textbook: *Numerical Analysis*, 9th edition, Thomson.

Objectives: Upon completion of this course, the students are expected to gain the understanding of the fundamental concepts of numerical analysis and computational techniques for solving nonlinear equations with a single variable, ordinary differential equations, systems of linear algebraic equations, as well as the techniques for numerical integration, differentiation, interpolation and approximation.

Assignments and Grading: Bi-weekly homework and two in-class midterm exams are given. There is no final exam. Exam schedule and policies are posted on Blackboard. The course grade is determined by the homework and exams with each having the following weights:

Homework	40%
Midterm 1	30%
Midterm 2	30%

Topics:

The list is subject to change. Section numbering according to the Reference Textbook.

1.2 Round-off Errors and Computer Arithmetic

1.3 Algorithms and Convergence

2.1 The Bisection Method

2.2 Fixed-Point Iteration

2.3 Newton's Method and Its Extensions

2.4 Error Analysis for Iterative Methods

3.1 Interpolation and the Lagrange Polynomial

3.5 Cubic Spline Interpolation

4.1 Numerical Differentiation

4.3 Elements of Numerical Integration

5.1 The Elementary Theory of Initial-Value Problems

5.2 Euler's Method

5.3 Higher-Order Taylor Methods

5.4 Runge-Kutta Methods

5.11 Stiff Differential Equations

6.1 Linear Systems of Equations

6.2 Pivoting Strategies

6.3 Linear Algebra and Matrix Inversion

6.5 Matrix Factorization

COVID-19 Information

Students are encouraged to visit the University's [COVID-19](#) website for important information including on-campus testing, vaccines, diagnosis and symptom protocols, campus cleaning and safety practices, report forms, and positive cases on campus. Please check the website throughout the semester for updates.

Vaccinations

Data suggests that vaccination remains the best intervention for reliable protection against COVID-19. Students are asked to familiarize themselves with pertinent [vaccine information](#), consult with their health care provider. The University strongly encourages all students, faculty and staff to be vaccinated.

Reasonable Academic Adjustments/Auxiliary Aids

The University of Houston complies with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, pertaining to the provision of reasonable academic adjustments/auxiliary aids for disabled students. In accordance with Section 504 and ADA guidelines, UH strives to provide reasonable academic adjustments/auxiliary aids to students who request and require them. If you believe that you have a disability requiring an academic adjustments/auxiliary aid,

please contact the [Justin Dart Jr. Student Accessibility Center](#) (formerly the Justin Dart, Jr. Center for Students with DisABILITIES).

Excused Absence Policy

Regular class attendance, participation, and engagement in coursework are important contributors to student success. Absences may be excused as provided in the University of Houston [Undergraduate Excused Absence Policy](#) and [Graduate Excused Absence Policy](#) for reasons including: medical illness of student or close relative, death of a close family member, legal or government proceeding that a student is obligated to attend, recognized professional and educational activities where the student is presenting, and University-sponsored activity or athletic competition. Under these policies, students with excused absences will be provided with an opportunity to make up any quiz, exam or other work that contributes to the course grade or a satisfactory alternative. Please read the full policy for details regarding reasons for excused absences, the approval process, and extended absences. Additional policies address absences related to [military service](#), [religious holy days](#), [pregnancy and related conditions](#), and [disability](#).

Recording of Class

Students may not record all or part of class, livestream all or part of class, or make/distribute screen captures, without advanced written consent of the instructor. If you have or think you may have a disability such that you need to record class-related activities, please contact the [Justin Dart, Jr. Student Accessibility Center](#). If you have an accommodation to record class-related activities, those recordings may not be shared with any other student, whether in this course or not, or with any other person or on any other platform. Classes may be recorded by the instructor. Students may use instructor's recordings for their own studying and notetaking. Instructor's recordings are not authorized to be shared with anyone without the prior written approval of the instructor. Failure to comply with requirements regarding recordings will result in a disciplinary referral to the Dean of Students Office and may result in disciplinary action.

Syllabus Changes

Due to the changing nature of the COVID-19 pandemic, please note that the instructor may need to make modifications to the course syllabus and may do so at any time. Notice of such changes will be announced as quickly as possible through email and/or Blackboard.

UH Email

Email communications related to this course will be sent to your [Exchange email account](#) which each University of Houston student receives. The Exchange mail server can be accessed via Outlook, which provides a single location for organizing and managing day-to-day information, from email and calendars to contacts and task lists. Exchange email accounts can be accessed by logging into Office 365 with your Cougarnet credentials or through Access UH. They can also be configured on [IOS](#) and [Android](#) mobile devices. Additional assistance can be found at the [Get Help](#) page.

Counseling and Psychological Services (CAPS) Statement

Counseling and Psychological Services (CAPS) can help students who are having difficulties managing stress, adjusting to college, or feeling sad and hopeless. You can reach CAPS (www.uh.edu/caps) by

calling 713-743-5454 during and after business hours for routine appointments or if you or someone you know is in crisis. No appointment is necessary for the “Let's Talk” program, a drop-in consultation service at convenient locations and hours around campus.