MATH 5600-001: Survey of Numerical Analysis Spring 2023

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Office: JWB 109
Office Hours: MTWF 11:50-12:20 and by appointment. May be revised by class preference.

Class Time and Location: MTWF 10:45 – 11:35 in LCB 323

Course Information: This is a 4-credit course.

Course Description:

Numerical linear algebra, interpolation, integration, differentiation, approximation (including discrete and continuous least squares, Fourier analysis, and wavelets), initial- and boundary-value problems of ordinary and partial differential equations. Programming experience is necessary prior to taking this course.

Learning objectives:

Upon successful completion of this course, a student will be able to:

1. Understand, analyze, and implement algorithms for different numerical problems
2. Understand round-off error and its consequences in computing.
3. Master algorithms for solving nonlinear equations.
4. Solve linear systems with direct and iterative methods, understand convergence and preconditioners.
5. Solve least square problems.
6. Understand the power method to find the eigenvalues
7. Interpolate functions.
8. Approximate derivatives with finite difference methods and quantify the error.
9. Approximate definite integrals with numerical methods and quantify the error.
10. Solve ordinary differential equations with time-stepping methods and quantify errors.

Prerequisites:

"C" or better in Calculus (MATH 1260 or MATH 1321 or MATH 2210 or MATH 2310 or MATH 3140) AND Differential Equations & Linear Algebra (MATH 2270 or MATH 2250).

Text:

No textbook is required, though the course will be modeled on K. Atkinson's Introduction to Numerical Analysis and copies will be made available. I will provide supplementary materials and resources in Canvas through the semester.

Homework:

Problem sets associated with each topic will be announced in-class and subsequently posted on Canvas. Some sets may be delivered through the department's WeBWorK system. The homework will be a mixture of problems solved by hand and programming assignments implementing key algorithms. Please contact the instructor regarding any difficulties with due dates or the material itself. Some collaboration is encouraged as long as it promotes individual understanding of and experience with the material.

Each homework assignment is worth equal weight, and over the course of the semester, your lowest homework score will be dropped.

Exams:

This course will have four in-class midterm exams and one final exam with a take-home portion. Sample exams and review sessions will precede each exam. Unless otherwise specified, calculators and notes will not be needed or permitted on the exams.

Grading:

Your course grade will be computed as follows:

Homework 30%
Midterm exams: 3 highest of 4, 15% each, total 45%
Final exam: 25%

Final letter grades will be assigned based on the following ranges:

- 92% - 100% — A
- 90% - 91% — A–
- 88% - 89% — B+
- 82% - 87% — B
- 80% - 81% — B–
- 78% - 79% — C+
- 72% - 77% — C
- 70% - 71% — C–
- 68% - 69% — D+
- 62% - 67% — D
- 60% - 61% — D–
- 0% - 59% — E

Attendance:

– Please contact the instructor in advance if you are unable to attend a class session. Absences due to unforeseen circumstances sometimes occur, but beyond a small number these are detrimental to individual and collective success.

– Attendance at scheduled class tests and exams is mandatory, unless prior consent has been given by the instructor.

Class communication:

Class communication will be done through Canvas and emails will go to your University of Utah email address. I will send a welcome message before the first day of class. If you do not receive this message, get into contact with me as soon as possible at the email above.

ADA Statement:

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability Services.

Student responsibilities and integrity:

All students are expected to maintain professional behavior in the classroom setting, according to the Student Code, spelled out in the Student Handbook. Students have specific rights in the classroom as detailed in Article III of the Code. The Code also specifies proscribed conduct (Article XI) that involves cheating on tests, plagiarism, and/or collusion, as well as fraud, theft, etc. Students should read the Code carefully and know they are responsible for the content. According to Faculty Rules and Regulations, it is the faculty responsibility to enforce responsible classroom behaviors, and I will do so, beginning with verbal warnings and progressing to dismissal from and class and a failing grade. Students have the right to appeal such action to the Student Behavior Committee.

http://regulations.utah.edu/academics/6-400.php