CAAM 453: NUMERICAL ANALYSIS I

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Class Time: MWF 9:00-9:50 am
Classroom: Duncan Hall 1046
Office Hours: MW 11:00-12:00 pm

1 Course Objectives and Learning Outcomes

This course is an introduction to a broad range of numerical methods for solving mathematical problems that arise in Science and Engineering. The goal is to provide a basic understanding of the derivation, analysis, and use of these numerical methods, along with a rudimentary understanding of finite precision arithmetic and the conditioning and stability of the various problems and methods. This will help you choose, develop and apply the appropriate numerical techniques for your problem, interpret the results, and assess accuracy. The problems cover (i) systems of linear equations, linear least squares problems, and eigenvalue calculation; (ii) interpolation, approximation, and integration of functions; (iii) initial values problems governed by ordinary differential equations; (iv) nonlinear scalar equations.

2 Prerequisites

Students must have a sound background in Calculus (I,II,III), a working knowledge of Linear Algebra, and must be proficient in Matlab programming. Required courses: MATH 212 or MATH 222 and CAAM 335 or equivalents, CAAM 210 or equivalent.

3 Required Texts and Materials

We will use the CAAM 453 Lecture Notes by Professor Mark Embree. This e-book may be downloaded at no cost. The material covered in this book will be supplemented with additional topics covered in class. Hence, regular attendance of the lectures is required. The material of this course is covered in many books on Numerical Analysis (call number QA 297) or on Scientific Computing (call number QA 183) and you are encouraged to browse the library. In particular, L. N. Trefethen and D. Bau III, Numerical Linear Algebra, SIAM, Philadelphia, 1997 is recommended. We shall use Matlab for programming exercises.

4 Exams and Homeworks

There will be one midterm exam and approximately seven homework assignments. The midterm exam will count for 30% of the final grade and the homework assignments will count for 70% of the final grade. One of the homework assignments will be pledged, and this one will count twice as much as each of the others equally weighted unpledged ones.

5 Grade Policies

- Homework will typically consist of a number of problems, which you may discuss with fellow classmates and this is encouraged. However, you are expected to individually write up your solutions. You may not consult solution sheets from past CAAM courses.
One of the homework assignments is pledged and you are not allowed to discuss it with anyone but your instructor or TA.

Some homework assignments will contain optional challenge questions, designed to deepen the understanding of the material. Strong performance on these optional challenge problems will be considered favorably when assigning borderline grades.

- NO LATE HOMEWORK will be accepted. Exceptions will only be made for documented illnesses or emergencies. We will automatically drop your worst two unpledged assignment scores.

- Homework frequently involves Matlab computer projects. Program source code must be turned in. On regular assignments you may discuss the coding projects with your fellow students. In no case are you allowed to share codes. Each student is responsible for writing her/his own codes.

- Look over the graded homework as soon as it is returned. If you detect mistakes in the grading, notify your instructor immediately. Homework scores will only be changed during the first two weeks after they have been returned.

- The midterm exam is take home and pledged. It is open book but only lecture notes and course material (class notes and homework assignments) can be consulted.

6 Absence Policies

Students are expected to contribute to our class community by attending and participating in the lectures.

7 Rice Honor Code

In this course, all students will be held to the standards of the Rice Honor Code, a code that you pledged to honor when you matriculated at this institution. If you are unfamiliar with the details of this code and how it is administered, you should consult the Honor System Handbook at http://honor.rice.edu/honor-system-handbook. This handbook outlines the University’s expectations for the integrity of your academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process.

8 Disability Support Services

If you have a documented disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with Disability Support Services (Allen Center, Room 111 / adarice@rice.edu / x5841) to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs.

9 Syllabus Change Policy

This syllabus is only a guide for the course and is subject to change with advance notice.