Math 305 - Numerical Analysis Syllabus - Fall 2024

Description
The methods learned in algebra and calculus often fall short when dealing with the complexities of various mathematical problems. Finding an exact solution often requires significant effort, and for many problems, it is even impossible to express an exact solution using simple functions like polynomials, trigonometric functions, or logarithms. This class enables us to approximate solutions to otherwise intractable problems using clever algorithms. While the course primarily emphasizes the theoretical aspects of these techniques, we will also explore their accuracy and efficiency. Additionally, students will gain a basic understanding of how to implement algorithms in a computational environment, evaluating their performance in terms of accuracy, computational complexity, and practical usability.

Instructor
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Teaching Assistant
TBA

Lecture and Office Hours
Lecture: Tuesday & Thursday, 10:00AM - 11:10AM, ENG B15
Office Hours: Thursday 1:00 - 2:00PM, SNA 164

Textbook
An Introduction to Numerical Analysis by Endre Suli and David Mayers.
An electronic copy can be accessed through librarys webpage.

Topics to be Covered

- Solution of equations by iterations (1.1 - 1.8)
- Solution of systems of linear equations (2.1 - 2.6, 2.7, 2.9)
- Symmetric and banded matrices (3.1 - 3.3)
- Simultaneous nonlinear equations (4.1 - 4.4)
- Eigenvalues, eigenvectors of a symmetric matrix (5.1 - 5.10)
- Polynomial interpolation (6.1 - 6.5)
- Numerical integration, Newton-Cotes quadrature (7.1 - 7.7)
- Polynomial approximation in the ∞-norm (8.1 - 8.5)
- Approximation in the 2-norm (9.1 - 9.4)
- Numerical integration, Gaussian quadrature (10.1 - 10.6)

Learn Hub
All of the course material - including lecture notes, homework, past exams - will be posted on learn hub.

You should follow the course mainly through learn hub. Announcements will be made through learn hub. and/or KUSIS.

Grading
Your final grade in the course will be computed based on the homework, two midterms, final and course participation as follows

- %15 (Homework) + %25 (Midterm 1) + %25 (Midterm 2) + %30 (Final) + %5 (Participation)

You will be using python for computational homework.

Make-up Exams
A student can be eligible for a make-up exam only if she/he provides proper medical reports approved by the health center at Koç University or an excuse form.

The final exam will be used as the make-up exam for the midterm exams. If a student misses the final exam for a legitimate reason, a separate make-up exam will be held after the final exam period.

Objectives
To equip students with fundamental tools in numerical analysis, including a basic understanding of computational algorithms. This includes numerical solutions for nonlinear equations and systems of nonlinear equations, direct and numerically stable solutions of linear systems, and numerical computation of eigenvalues. The course will also cover functional approximation theory, polynomial interpolation, and numerical integration techniques.

Classroom Code of Conduct
Students at Koç University are required to adhere to classroom code of conduct and to refrain from all forms of unacceptable behavior during lectures. The activities which are prohibited in class include and are not limited to the following:

- Arriving late or leaving early without the prior permission of the professor
- Engaging in side conversations
- Using cell phones and other electronic devices. All cell phones should be switched off before entering the lecture room. If you expect a very important call, please switch your phone to silent mode and let your professor know in advance that you may receive a call.
- Using laptops for purposes that are not course-related.

Please read the Koç University Student Code of Conduct from
`https://apdd.ku.edu.tr/en/academic-policies/student-code-of-conduct-2/` .