CENG 216 – Numerical Computation

2021–22 Spring Term

Instructor and Teaching Assistants

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Course Hours and Teams Code

Monday, 09:45–12:30
Teams Code: `e65du56`

Course Summary

This course covers the fundamentals of numerical computation starting with finite representation of real numbers and investigation of errors resulting from the discrete and approximate nature of the computation using such a representation. The course includes topics from numerical linear algebra, interpolation, numerical differentiation and integration, numerical solution of ordinary differential equations, basics of numerical optimization, and generation of random numbers with their application to numerical problems.

Textbooks

Main Textbook:
Numerical Analysis, The new international edition, 2ed, Timothy Sauer

Secondary Textbooks:
Numerical Algorithms: Methods for Computer Vision, Machine Learning, and Graphics, J. Solomon
Matrix Computations (4th Ed.), G. H. Golub and C. F. Van Loan

Grading

Assignment	Grade Percentage
Homeworks	40%
Midterm Exam	30%
Final Exam	30%

Collaboration Policy

Each homework will indicate whether it is a group homework or must be completed individually. All submitted homeworks will be checked against each other as well as sources on the internet both using automated software and manually.
ANY ATTEMPTS TO CHEAT IN THE HOMEWORK ASSIGNMENTS WILL RESULT IN DISCIPLINARY ACTION FOR **ALL** STUDENTS INVOLVED.

Topics

- Introduction
- Fundamentals (Chapter 0)
- Solving Equations (Chapter 1)
- Systems of Equations (Chapter 2)
- Interpolation (Chapter 3)
- Least Squares (Chapter 4)
- Numerical Differentiation and Integration (Chapter 5)
- Ordinary Differential Equations (Chapter 6)

Course Learning Outcomes

- To be able to explain the effects of the finite representation of real numbers on the implementation of a given algorithm.
- To be able to derive the numerical error in computations and compare the numerical error of different algorithms for the same problem.
- To be able to solve numerical problems requiring differentiation, integration, interpolation and/or optimization.
- To be able to apply iterative solutions to numerical problems.
- To be able to derive linear/nonlinear systems for a given problem description.
- To be able to select and apply a numerical algorithm to a given linear/nonlinear system.