CSC336H1: Numerical Methods, Spring 2024
University of Toronto
Syllabus

Lectures: Tuesdays 3–5pm, Thursdays 3–4pm in FE 230

Instructor: Kirill Serkh
Email: kserkh@math.toronto.edu
Office Hours: Tuesdays 5–6pm in BA 6260

Textbook: *An Introduction to Numerical Analysis*, by Endre Süli and David Mayers

Other references:
Scientific Computing: An Introductory Survey, 2nd ed., by Michael T. Heath
Numerical Methods in Scientific Computing, Vols I and II, by Germund Dahlquist and Åke Björck

Grading: 50% homework, 20% midterm, 30% final exam

Course contents:

1. Floating point arithmetic: correctly rounded arithmetic, rounding error, cancellation error, condition number
2. Sequences and series: accelerating convergence, asymptotic series
3. Numerical linear algebra: least squares, Gram-Schmidt procedure, singular value decomposition, eigenvalue algorithms
4. Nonlinear optimization: rootfinding, bisection, Newton's method, continuation method, simplex methods
5. Fourier analysis and signal processing: fast Fourier transform, Nyquist frequency, bells, Gibbs phenomenon
6. Quadrature: Gaussian quadrature, adaptive integration, Euler-Maclaurin formula, Newton-Cotes formulas
7. Function approximation and interpolation: Lagrange interpolation, Weierstrass theorem, best approximating polynomial, Chebyshev approximation, Runge phenomenon
8. Searching and sorting: quicksort, quadtrees and octrees, curse of dimensionality
9. Probability and random numbers: random number generators, randomness tests, Monte Carlo, bootstrap
10. Differential equations: finite differences, initial value problems, boundary value problems, Euler's method, Richardson extrapolation, the finite element method

Homeworks:

There will be a total of 5 homeworks, each worth 10% of your grade, with the due dates Jan. 18, Feb. 1, Feb. 15, Mar. 19, and Apr. 4. The homeworks will involve a combination of mathematics and programming. You should use either MATLAB or NumPy for your homeworks.

Midterm exam:

The midterm exam will be held in class on Feb. 27, and will be worth 20% of your grade.

Lateness:

The penalty for late homeworks is a 10% deduction for every day it is late.

Academic integrity:

You must write your own homework assignments, and you may not get any outside help for your term projects and exams. The following helpful webpage answers many questions on this topic: https://www.academicintegrity.utoronto.ca/perils-and-pitfalls/.

Accessibility:

If you have any accessibility-related concerns, please let me know. More information can be found here: https://studentlife.utoronto.ca/department/accessibility-services/.

Student resources:

The academic calendar is available here: https://fas.calendar.utoronto.ca/sessional-dates. Some general information about the current academic year is available here: https://www.utoronto.ca/utogether. The University offers online "study with me" sessions where you can study together here: https://sidneysmithcommons.artsci.utoronto.ca/meet-to-complete/. You can also form or join study groups with your classmates here: https://sidneysmithcommons.artsci.utoronto.ca/recognized-study-groups/.

Absence declarations:

Students who are absent from academic participation for any reason (e.g., COVID, cold, flu and other illness or injury, family situation) and who require consideration for missed academic work have been asked to record their absence through the ACORN online absence declaration. Students must also advise their instructor of their absence. Instructors will not be automatically alerted when a student declares an absence. More details are available here: https://registrar.utoronto.ca/policies-and-guidelines/absence-declaration/.