CSC336H1: Numerical Methods, Fall 2022
University of Toronto
Syllabus

Lectures: Tuesdays 1pm–3pm in MS 2172

Instructor: Kirill Serkh
Email: kserkh@math.toronto.edu
Office Hours: TBD
Teaching Assistants: Zewen Shen (zewen.shen@mail.utoronto.ca), Mohan Zhao (mohan.zhao@mail.utoronto.ca), Mengfei Liu (mengfei.liu@mail.utoronto.ca)

Textbook: *Numerical Methods*, by Germund Dahlquist and Åke Björck

Other references: *An Introduction to Numerical Analysis*, by Endre Süli and David Mayers
Scientific Computing: An Introductory Survey, 2nd ed., by Michael T. Heath

Grading: 50% homework, 20% term project, 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

Tutorials:

Section	Time	Delivery	TA	Room
0101A	Thurs. 1-2pm	In-person	Zewen	BA 2175
0101B	Thurs. 1-2pm	In-person	Mohan	BA B024
0101C	Thurs. 1-2pm	In-person	Mengfei	BA 2135

Homeworks:

There will be a total of 5 homeworks, each worth 10% of your grade, with the due dates Sept. 22, Oct. 6, Oct. 20, Nov. 3, and Dec. 7. The homeworks will involve a combination of mathematics and programming.

Term project:

The term project will be programming assignment, worth 20% of your grade, with the due date Nov. 24, which you will write in either MATLAB or NumPy.

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:

For Fall 2022, the Verification of Illness (or "doctor's note") is not required. 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 should also advise their instructor of their absence. Instructors will not be automatically alerted when a student declares an absence.