Lecturer: Christina C. Christara (ccc@cs.toronto.edu)

Lectures: Tuesday 13:00-15:00 Room GB 244

Tutorial: Thursday 13:00-14:00 Room SS 1085 (tutorial times may be used for lectures)

Office Hours: Monday 13:30-14:30 Room BA 4226

Teaching Assist.: Yuwei Chen, Deeksha Adil, Ray Wu, Jienan Yao

Textbook: Michael Heath, Scientific Computing: an introductory survey, SIAM 2018 available from the SIAM website, cheaper if you become member, see details in course website below equivalent to same book McGraw-Hill Inc. 2002, custom-copy used in past years

Website: http://www.cs.toronto.edu/~ccc/Courses/336.html


Aims of course
Introduce numerical methods for solving (linear and nonlinear) equations, and approximation problems.
Evaluate numerical methods with respect to their accuracy, time and memory complexity.
Develop and practice computer skills in implementing numerical methods efficiently on the computer.
Use high level software for studying numerical methods.

Skills / Knowledge testing in the course
Apply basic principles, not recall lecture notes in detail
Problem recognition
Method recognition
Apply a given method correctly
Solve a numerical problem efficiently and reliably using high level mathematical software.

Prerequisite Mathematics and other
Ability to handle notation and to do algebraic manipulation
Matrix and vector addition and multiplication, elementary row operations, linear (in)dependence
Differentiation and integration of polynomial, trigonometric, exponential, logarithmic and rational functions
Elementary calculus including Taylor series, Rolle’s and mean value theorems, functions graphs, continuity, limits, de l’Hospital’s rule, etc.
Induction
Other: knowledge of some programming language, such as MATLAB.

Computer accounts
You will get (or have already) a computer account on the CDF Unix system. Consoles/workstations are located in the Bahen building. You must log-in frequently and read mail, news and other messages relating to the course through your account.

Marks distribution
Assignment 1 Due Thursday, February 6, 2020 12%
Term test Thursday, February 27, 2020 24%
Assignment 2 Due Thursday, March 12, 2020 12%
Assignment 3 Due Thursday, April 2, 2020 12%
Final exam 2 hours 40%

Must get at least 33% in the final exam.
Must get at least 33% average in the computer assignments.
Midterm test and Final exam: calculators are the only aids permitted.

Problem sets / Computer assignments
problem sets: please write as clearly as possible.

Capitalize or underline your last name in the front page of your paper.

computer assignments: don’t leave it to the last minute - think of the following
– the machine being down, when you need it.
– the workstation room being crowded.
– the printer being stuck, when you are just at the time to get your final listing.
– accidentally deleting an important file.
overcome this by using backup procedures (for the source and data files only).
The above are not good reasons for extension of the assignment due date.
Late assignment policy
Assignments are due the day posted, during class time. Assignments submitted late have a reduction of marks based on the maximum total marks the assignment could get had it been submitted on time (and not on the total marks the assignment actually got). Each day costs 10%, to a maximum of 3 (three) days. Assignments submitted later than 3 days after the due date do not receive any marks. If applicable, weekends and holidays count as regular days for the purpose of late assignment policy.

Topics to be covered
• Computer Arithmetic and Computational Errors (Ch 1) – 6 hours
  Representation of numbers, machine arithmetic
  Round-off error, error propagation, conditioning, stability
• Square linear systems of equations (Ch. 2) – 10 hours
  Gauss elimination, LU factorisation, pivoting, scaling, forward and back substitution
  Vector & matrix norms
  Condition numbers for systems
• Nonlinear equations / systems (Ch. 5) – 8 hours
  Bisection, secant
  Fixed point iteration, Newton’s method
  Convergence
• Interpolation (Ch. 7) – 7 hours
  Polynomial interpolation
  Piecewise polynomial interpolation
  Spline interpolation

Other references
Conte, S. D. and Carl de Boor
Elementary Numerical Analysis
McGraw-Hill Inc., or SIAM

Johnson, L. W. and R. D. Riess
Numerical Analysis
Addison Wesley

D. Kahaner, C. Moler, S. Nash
Numerical Methods and Software
Prentice Hall

Stoer, J. and R. Bulirsch
Introduction to Numerical Analysis
Springer Verlag

Richard L. Burden and J. Douglas Faires
Numerical Analysis
Brooks/Cole

Hager, William
Applied Numerical Linear Algebra
Prentice Hall

Moler, Cleve
Numerical Computing with MATLAB
Cambridge Univ. Press

The Heath book published by SIAM is equivalent to the custom-made copy used in the past for the same course. This is the same book used for CSC436, and for the Fall version of CSC336.