Numerical Analysis
amath740, cs770
Fall 2017

This is a core course for graduate students in Applied Mathematics. It will also be of interest to students in Engineering and Science who wish to understand and use methods of numerical analysis. The course aims to be an introduction to basic algorithms and techniques of numerical computing.

Instructor: Prof. Krivodonova, MC 6106, lgk@math.uwaterloo.ca
TA: Abdullah Sivas, aasivas@uwaterloo.ca
Lecture times: 10:00 - 11:20 a.m., Mondays and Wednesdays, in DC 2585
Final Exam: December 7th, 2017, 12:30-3:00

Outline:

- floating point arithmetic

- numerical linear algebra (solution of linear systems, eigenvalue problems, and the singular value decomposition)

- polynomial interpolation

- numerical differentiation and integration

- root finding for nonlinear equations and systems

- numerical ordinary differential equations

- approximation methods (least squares, orthogonal polynomials, and Fourier transforms).

Recommended references: The course covers a standard set of topics that can be found in many text books titled "Numerical Analysis" or "Introduction to Scientific Computing". UW library has a number of electronic books, e.g. by Gautschi or Quarteroni & Sacco. A book by Heath is an easy to follow modern source (prohibitively expensive though). Isacsoon & Keller is a classic (and is cheaply available from Dover).

Prerequisites: Basic knowledge of Matlab. For students who have had no experience with programming, it is recommended to download and install Octave (a free equivalent of basic Matlab) and familiarize themselves with the environment.

Assignments: There will be a few assignments of theoretical and/or computational nature. You can use any programming language that you like for your assignments. You can discuss problems and compare answers with your classmates. You can also consult outside help and sources. However, the final write-up should be strictly your own work. You can take one (no questions asked) three day extension on assignments.

Final mark: The breakdown for the final mark will be 50% for assignments and 50% for the final exam.

Late assignments/Make-up exams: Beyond the above mentioned extension on one assignment, there will be no make-up exams and no extensions for assignments except under extenuating (and documented) circumstances. If you are ill, please be prepared to provide a note from the health center or your doctor. If your instructor decides that your circumstances warrant an excuse, your final grade will be calculated based on your performance on the remaining tests/assignments. When possible, an advance notice mustbe given.

Grade appeals: We will make every e ort to be fair and consistent in the marking; however you should always check over your work to see that it has been marked appropriately. Grade appeals must be submitted to the TA in writing within one week of the date the assignment was returned to you. For this reason, it is especially important that you pick up and look over all returned assignments on the day they are returned.

Academic Integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check www.uwaterloo.ca/academicintegrity/ for more information.]

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy70, Student Petitions and Grievances, Section 4, www.adm.uwaterloo.ca/infosec/Policies/policy70.htm. When in doubt please be certain to contact the departments administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing an academic offense, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g., plagiarism, cheating) or about rules for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate Associate Dean. For information on categories of offenses and types of penalties, students should refer to Policy 71, Student Discipline,www.adm.uwaterloo.ca/infosec/Policies/policy71.htm. For typical penalties check Guidelines for the Assessment of Penalties, www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm.

Appeals: A decision made or penalty imposed under Policy 70 (Student Petitions and Grievances) (other than a petition) or Policy 71 (Student Discipline) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy72 (Student Appeals) www.adm.uwaterloo.ca/infosec/Policies/policy72.htm.

Note for Students with Disabilities: The Office for Persons with Disabilities (OPD),located in Needles Hall, Room 1132, collaborates with all academic departments to arrangeappropriate accommodations for students with disabilities without compromising the academicintegrity of the curriculum. If you require academic accommodations to lessen the impact ofyour disability, please register with the OPD at the beginning of each academic term.