

MATH 6020 – Scientific Computing

Fall 2019

Department of Mathematics and Statistics, University of Guelph

Instructor: Prof. A. Willms, MACN 512, ext. 52736

Office Hours: MW 11:00–12:00 or by appointment.

Lectures: MW 1:00–2:20 in MINS 128

Web Site: University's CourseLink system, <http://www.courselink.uoguelph.ca/>.

Calendar Description

This course covers the fundamentals of algorithms and computer programming. This may include computer arithmetic, complexity, error analysis, linear and nonlinear equations, least squares, interpolation, numerical differentiation and integration, optimization, random number generators, Monte Carlo simulation; case studies will be undertaken using modern software.

Objectives

This course typically has students from a broad range of backgrounds. The objective is to teach students basic programming skills in C and introduce them to a number of different numerical algorithms for the solution of scientific programming problems.

Topics

C programming including functions, parameter passing, pointers, and structures. We will cover linear algebra topics including QR factorization and least squares minimization, eigenvalues, the singular value decomposition, and iterative methods to solve linear systems.

Resources

Most of the material in the course will come from the text

- *Numerical Linear Algebra*, L.N. Trefethen and D. Bau III, SIAM, Philadelphia, 1997.

This text is on reserve in the library. If you want your own copy of this excellent text, I noticed some on Amazon.com for about US\$60, and on Amazon.ca for about C\$100.

Other texts that are useful references include:

- *Iterative Methods for Sparse Linear Systems*, 2nd edition, Y. Saad, SIAM 2003.
- *Numerical Analysis*, 8th edition, R. Burden and D. Faires, Thompson Brooks/Cole, 2005.
- *Numerical Analysis*, 2nd edition, T. Sauer, Pearson, 2012.
- *Accuracy and Stability of Numerical Algorithms*, 2nd edition, N. Higham, SIAM, Philadelphia, 2002.

In addition, the primary reference for the C programming language is also on reserve:

- *The C programming language* 2nd edition, B.W. Kernighan, D.M. Ritchie, Prentice Hall, Englewood Cliffs, N.J., 1988.

Evaluation

There will be three assignments and a final take home exam. All of these will contain a significant programming component. You will be required to write and submit computer code written in C.

Assessment	date	weight
3 Assignments	2 Oct., 28 Oct., 20 Nov., in class.	60%
Take-home Final Exam	Issued 27 Nov. Due 10 Dec., 4:00 p.m.	40%

University Policies

E-mail Communication

All students are required to check their University of Guelph e-mail account regularly; e-mail is the official route of communication between the University and its students.

Academic Accommodation of Religious Obligations

If you are unable to complete a course requirement due to religious obligations, please let the instructor know within the first two weeks of class. See the academic calendar for more information:

http://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/sec_d0e2216.shtml

Academic Consideration

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor in writing, with your name, id, and e-mail contact. See the academic calendar for information on regulations and procedures for Academic Consideration:

http://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/sec_d0e2180.shtml

Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community, faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection. Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor. The Academic Misconduct Policy is detailed in the Graduate Calendar:

http://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/sec_d0e2630.shtml

Accessibility

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. For more information, see:

http://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/sec_d0e2343.shtml

Drop date

Students will have until the last day of classes to drop courses without academic penalty. See the Graduate Calendar information at

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

Recording of Materials

Presentations which are made in relation to course work, including lectures, cannot be recorded in any electronic media without the permission of the presenter, whether the instructor, a student, or guest lecturer. When recordings are permitted they are solely for the use of the authorized student and may not be reproduced, or transmitted to others, without the express written consent of the presenter.