

MATH*6020 Course Outline Form: Winter 2016

General Information

Course Title: Scientific Computing

Course 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.

Credit Weight: 0.5

Academic Department (or campus): Mathematics & Statistics

Campus: University of Guelph

Semester Offering: Winter 2016

Class Schedule and Location: TUE, THU 10:00-11:20, CRSC403

Instructor Information

Instructor Name: Hermann J Eberl
Instructor Email: heberl@uoguelph.ca
Office location and office hours: MACN508, THU 15:30-16:30

Course Content

Specific Learning Outcomes:

- This course will increase the students computational literacy, both theoretically and practically
- Students will be introduced to current numerical methods and learn about theoretical considerations to assess efficiency and accuracy of numerical approximations to exact solutions
- Students will gain hands-on experience using current computing technology to solve selected mathematical problems that arise frequently in mathematics and its application areas
- Students will learn to design, implement, and test computational strategies for numerical problems

Lecture Content:

- floating point systems and computer arithmetics, errors, conditioning
- review of direct linear solvers
- stationary and nonstationary iterative linear solver
- sparse matrix formats
- iterative nonlinear solvers
- numerical differentiation and approximation of differential equations
- Fortran programming
- visualization

Course Assignments and Tests:

Assignment 1	February 2nd	15 %
Assignment 2	February 23rd	15 %
Programming project and report	April 15	50 %
Final exam	April 14 or as agreed otherwise	20%

Final examination date and time:

The Final Exam will be an oral exam of 25min per student. By default, these exams will take place on THU April 14, 9:30-19:30, or at another time that week, as mutually agreed by instructor and student; room TBA.

Course Resources

Required Texts: none

Recommended Texts:

Y. Saad, "Iterative methods for sparse linear systems", 2nd ed,
http://www-users.cs.umn.edu/~saad/IterMethBook_2ndEd.pdf

R. Barret et al, "Templates for the solution of linear systems: Building blocks for iterative methods", www.netlib.org/templates/templates.pdf

Both books were originally published by SIAM but we will use the above online versions.

Other Resources:

- GNU Fortran (binaries and documentation): <http://gcc.gnu.org/fortran/>
- Additional resources (literature and software) will be announced in class and links will be provided on the course web-page: <http://www.uoguelph.ca/~heberl/M6020.html>

Course Policies

Grading Policies

- late assignments will not be accepted without *a priori* instructor consent
- see also <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-grds.shtml>

Course Policy on Group Work:

All coursework is individual work. Group submissions will not be accepted.

Course Policy regarding use of electronic devices and recording of lectures

Electronic recording of classes is expressly forbidden without consent of the instructor. 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 instructor.

Additional Course Information

The use of computers is an important part of this course. All students must make sure that they have access to a suitable computer (e.g. through CPES computing laboratories, their personal computers, or resources in their grad student offices). We will use software that is freely available for Linux, Windows and MacOS/X operating systems.

University Policies

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:

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.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/undergraduate/current/c08/c08-ac.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 Undergraduate Calendar:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.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. Students requiring service or accommodation, whether due to an identified, ongoing disability or

a short-term disability should contact the Student Accessibilities Services (SAS) as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: <http://www.uoguelph.ca/csd/>

Course Evaluation Information

Please see <http://www.mathstat.uoguelph.ca/files/TeachevaluationformF10.pdf>

Drop date

The last date to drop one-semester courses, without academic penalty, is **Friday, March 11, 2016**. For regulations and procedures for Dropping Courses, see the Academic Calendar: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>