Department of Mathematics & Statistics
Concordia University

MAST 334 (MATH 354)
Numerical Analysis
Fall 2020

Delivery method: **This course, the midterm and final exam, will be online.**

Instructor*: _____

Email: _____

Office Hours: _____

*Students will get the above information from their instructor on Moodle. The instructor is the person to contact should there be any questions about the course.

Objectives: Numerical analysis deals with algorithms for the approximate solutions of mathematical problems whose exact solution is either impossible or unreasonably complicated. Lying at the intersection of mathematics and computer science, numerical analysis is a key component of modern scientific computing and its countless applications. In this course, students will learn how to solve problems such as solving nonlinear equations, numerical differentiation and integration, and approximating functions from data. Considerable emphasis will be given to the theoretical foundations of numerical methods, including the concepts of error analysis, best approximation, and the trade-off between accuracy and computational complexity.

Text: ***Numerical Analysis***, by R. L. Burden and J. D. Faires, 9th Edition, Brooks/Cole, Engage Learning, 2011.
E-textbook: https://www.cengage.ca/shop/isbn/9781133384601
The digital version of the textbook will be available at:
https://www.co-opbookstore.ca/service/textbooks/
The print version of the textbook will be available at:
https://www.bkstr.com/concordiastore/home
Note: Students should order textbooks as early as possible, especially for print versions in case books are backordered or there are any shipping delays.

Assignments: Assignments are very important as they indicate the level of difficulty of the problems that students are expected to solve and understand independently. Students are encouraged to use a computer algebra system or a programming environment of their choice to complete the assignments (e.g., Matlab, Octave, R,

Python, Maple, Mathematica). Students are expected to submit assignments weekly via Moodle. **Late assignments will not be accepted.**

Midterm Test: There will be one midterm test in week 8.
PLEASE NOTE: It is the Department's policy that tests missed for any reason, including illness, cannot be made up. If a student missed the mid-term test for a valid reason (such as illness), they should contact their instructor.

Final Examination: At the end of course, there will be a 3-hour open book final examination. **PLEASE NOTE:** Students are responsible for finding out the date and time of the final exam once the schedule is posted by the Examination Office. Any conflicts or problems with the scheduling of the final exam must be reported directly to the Examination Office, **not** to your instructor. It is the Department's policy and the Examination Office's policy **that students are to be available until the end of the final exam period. Conflicts due to travel plans will not be accommodated.**

Online Tests: The mid-term test and the final exam will be held online via Moodle.

Final Grade: The highest of the following:
(25% assignments + 25% mid-term test + 50% final exam)
or
(25% assignments + 15% mid-term test + 60% final exam)

If the grading scheme for this course includes graded assignments, a reasonable and representative subset of each assignment may be graded. Students will not be told in advance which subset of the assigned problems will be marked and should therefore attempt all assigned problems.

Plagiarism: Cases of plagiarism (including the assignments, the mid-term test and the final exam) will be treated according to the University policy.

Week	Sections	Topics
1	1.1	Review of Calculus
	1.2	Round-off Errors and Computer Arithmetic
	1.3	Algorithms and Convergence
2	2.1	The Bisection Method
	2.2	Fixed-point Iteration
3	2.3	Newton's Method and Secant Method
	2.4	Error Analysis for Iterative Methods
4	2.5	Accelerating Convergence (Aitken's and Steffensen's Methods)
	3.1	Interpolation and Lagrange Polynomial

5	3.2 3.3	Data Approximation and Neville's Method Divided Differences
6	3.4 3.5	Hermite Interpolation Cubic Spline interpolation
7	8.1	Discrete Least Squares Approximation **Review**
8	 8.2	**Mid-Term Test (on material from weeks 1-5)** Orthogonal Polynomials and Least Squares Approximation
9	8.3	Chebyshev Polynomials and Economization of Power Series
10	8.5 8.6	Trigonometric Polynomial Approximation Fast Fourier Transform
11	4.1 4.2	Numerical Differentiation Richardson's Extrapolation
12	4.3 4.4	Elements of Numerical Integration Composite Numerical Integration
13	4.7	Gaussian Quadrature Formulas **Review**

Academic Integrity and the Academic Code of Conduct
This course is governed by Concordia University's policies on Academic Integrity and the Academic Code of Conduct as set forth in the Undergraduate Calendar and the Graduate Calendar. Students are expected to familiarize themselves with these policies and conduct themselves accordingly. "Concordia University has several resources available to students to better understand and uphold academic integrity. Concordia's website on academic integrity can be found at the following address, which also includes links to each Faculty and the School of Graduate Studies: concordia.ca/students/academic-integrity." *[Undergraduate Calendar, Sec 17.10.2].*

Content belonging to instructors shared in online courses, including, but not limited to, online lectures, course notes, and video recordings of classes remain the intellectual property of the faculty member. It may not be distributed, published or broadcast, in whole or in part, without the express permission of the faculty member. Students are also forbidden to use their own means of recording any elements of an online class or lecture without express permission of the instructor. Any unauthorized sharing of course content may constitute a breach of the Academic Code of Conduct and/or the Code of Rights and Responsibilities.

Disclaimer: In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in the course is subject to change.