Department of Mathematics & Statistics
Concordia University

MATH 354 (MAST 334)
Numerical Analysis
Fall 2016

Instructor: Dr. N. Rossokhata, Office: LB 915-1 (SGW), Phone (514) 848-2424, Ext. 2130
Email: nataliia.rossokhata@concordia.ca

Objectives: Numerical analysis deals with the approximate numerical solutions of the problem whose exact solution is either impossible or unreasonably complicated. Thus, numerical analysis is an interface between the theoretical mathematics and its innumerable applications. In this courses the students will learn how to solve the basic numerical problems using advanced analytical tools and computational systems for the actual computations. Theoretical aspects such as error analysis, best approximation, methods providing solutions with better convergence and less computational complexity will be considered.

Text:

1. ***Numerical Analysis***, by R. Burden and D. Faires, 9th Edition, Brooks/Cole, Cengage Learning, 2011.

2. ***Numerical Analysis***, course-pack, by D. Dryanov, Concordia University, 2013.
   Contains the basic theory, exercise problems and Maple codes.

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 Maple or other software of such kind during assignments. Students are expected to submit assignments on a weekly basis during the last class of the following week. **Late assignments will not the accepted.** Some questions (but not all) will be marked. Solutions, together with this outline, will be posted electronically on the course's Moodle website, which is accessible through your portal.

Mid-term 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 your miss a test, the Final Exam will count for 90% of your final grade.

Final Examination: At the end of course, there will be a 3-hour closed 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.**

Final Grade: The highest of the following: (20% assignments + 20% midterm test + 60% final exam) or (10% assignments + 90% final exam).

Calculators: Only calculators approved by the Department (with a sticker attached as proof of approval) are permitted in the class test and final examination. The preferred calculators are the **Sharp EL531** and **Casio FX 300MS**, available at the Concordia Bookstore.

Week	Sections	Topics	Pages	Assignments
1	1.1 1.2 1.3	Review of Calculus Round-off Errors and Computer Arithmetic Algorithms and Convergence	p.14 p. 28 p.39	2(b), 3(c), 13 5(c,d,h), 12, 13(a),21 7(d),15
2	2.1 2.2	The Bisection Method Fixed-point method	p.54 p.64	8, 12, 15, 19 4, 8, 9, 12(d), 20
3	2.3	Newton's Method and Its Extensions – Newton-Raphson and Chebyshev Fixed Point Methods	p.75	6(b), 8(b), 10(b), 18, 25, 32
4	2.4 2.5 2.6	Error Analysis for Iterative Methods Accelerating Convergence – Aitken's method, Steffenson's method Zeros of Polynomials, Horner's Method	p.85 p.90 p.100	2(a), 4(a), 7, 10 12(b),15 2(g)
5	3.1 3.2	Interpolation and Lagrange Polynomial Data Approximation and Neville's Method	p.114 p.123	2(d), 4(d), 9, 13(d), 17, 18(a) 3, 4, 6, 8, 10
6	3.3 3.4	Divided Differences Hermite Interpolation	p.133 p.142	8, 9, 12, 16, 17, 15, 19 9, 10, 12
7	3.5	Cubic Spline interpolation. Review	p.161	4(c), (c), 8(c), 12, 13, 19, 28
8	 8.1	Class Test (weeks 1 – 5) Discrete Least Squares Approximation	 p.506	 5, 14

9	8.2	Orthogonal Polynomials and Least Squares Approximation	p.518	2(e), 4(e), 6(e), 7(c), 11, 14
10	8.3	Chebyshev Polynomials and Economization of Power Series	p.527	2(b), 4(b), 5(d), 7, 8, 11
11	4.1 4.2	Numerical Differentiation Richardson's Extrapolation	p.182 p.191	2(b), 4(b), 6(a), 20, 28 1(c), 2(c), 6, 9
12	4.3 4.4	Elements of Numerical Integration Composite Numerical Integration	p.202 p.210	1(g), 3(g), 9(g), 11(g), 15,18 11(a,c)
13	4.7	Gaussian Quadrature Formulas Review	p.234	1(f), 2(f), 6, 8