Department of Mathematics & Statistics
Concordia University

MATH 354 (MAST 334)
Numerical Analysis
Fall 2014

Instructor*: _____

Office/Tel No.: _____

Office Hours: _____

*Students should get the above information from their instructor during class time. The instructor is the person to contact should there be any questions about the course.

Course Examiner: Dr. A. Shnirelman

Objectives: Approximate solutions when exact solutions are either impossible or hard and time-consuming. Error analysis. Best approximants, accelerating of convergence. Algorithms and alternate methods of approximate solutions with less computational complexity.

In this course the students will be involved in computations in order to apply techniques and obtain acceptable answers but the emphasis will be on the underlying theory.

Texts:

1. *Numerical Analysis*, by R. Burden and D. Faires, 9th Edition, Brooks/Cole, Cengage Learning, 2011. Copy of the textbook is reserved or the course in Concordia Webster Library, LB building.

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

Assignments: Students are expected to submit assignments weekly. Assignments are very important as they indicate the level of difficulty of the problems that students are expected to solve and understand them independently. The assignments will be corrected and graded. These grades together are worth a maximum of 10% of the final grade. The assignment problems and solutions to the assignment problems will be posted on Moodle. Students are encouraged to use Maple or other such software to do the assignments.

Tests: One-hour midterm test covering the first six weeks will be given in week 7 (or later).

Final Grade: The highest of the following: (10% assignments + 20% class test + 70% 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.

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

Week	Sections	Topics
1	1.2 1.3	Round-off error and computer arithmetic Algorithms and convergence Function computation by the Taylor series and the remainder estimate
2	1.1 2.1 2.2	Location of solutions of non-linear equations in intervals; Bisectional method Fixed-point method
3	2.3	Newton-Raphson fixed-point method, Steffenson fixed point method Chebyshev construction of fast convergent fixed-point methods
4	2.4 2.5	Error analysis for iterative methods, order of convergence Accelerating of convergence – Aitken's method, Steffenson's method
5	3.1 8.1	Lagrange interpolating polynomial, interpolation error Chebyshev polynomials, minimization of the interpolation error
6	3.2 3.3	Cone of Divided differences, Newton interpolating formula, error analysis Hermite interpolating polynomial, Taylor interpolating polynomial, error analysis
7	**Test** 3.4	One-hour Midterm test Cubic Spline interpolation
8	8.5	Approximation by trigonometric polynomials: Best continuous least squares approximants; Best discrete least squares approximants
9	8.6	Interpolation by trigonometric polynomials - Discrete Fourier Transform. Fast Fourier Transform – Cooley and Tukey algorithm
10	4.1 4.2	Numerical differentiation Richardson extrapolation
11	4.3 4.4	Quadrature formulae, degree of precision, Newton-Cotes quadrature formulae Composite numerical integration
12	4.5 4.7	Romberg integration (Euler-Maclaurin summation formula) Gaussian quadrature formulae
13		Review

- The assignment problems and solutions to the assignment problems will be posted on Moodle.
- Assignments for each week must be handed in at the beginning of the next week first class. **Late assignments will not be accepted.**