

CMSC/MAPL 460-0201 TTh 11-12:15 CSI 1121
COMPUTATIONAL METHODS Fall, 2007
<http://www.cs.umd.edu/users/oleary/c460/>

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Office Hours: Monday 1:15-3:15pm, Thursday 8-9am, and by appointment.
Please restrict telephone inquiries to office hour times, except in “emergencies.”
E-mail is welcome anytime!

Prerequisite: Matlab Programming, advanced calculus, linear algebra.

Text: *Introduction to Scientific Computing* by Charles F. van Loan, Prentice Hall.

Topics: Basic computational methods for solving problems which arise frequently in the physical, engineering, and natural sciences. Emphasis on problem solving methods and their computational aspects.

News: Assignments, course notes, answers to homeworks and quizzes, and announcements will be posted on the course’s homepage. You are responsible for checking this site before each class.

Final Exam: Monday, December 16, 8-10am

Teaching Assistant: Sima Taheri

Grading: Grading will be on a *curve*, except that you will be guaranteed an A if your average is 90% or better, a B if your average is 80% or better, etc.

- **Homework:** 7 assignments, approx. 100 points. 2 weeks will be allowed for each assignment. Assignments are due **before class begins**. One or more problems will be graded. There will be a 10% penalty for each day, or fraction of a day, late. If your homework average is less than 50%, then your course grade will be “F”, **regardless of your other grades**. Partial credit will be given for partially-working programs.
- **In-class Exercises:** Approx. 10 Matlab exercises, 5 points each. The lowest two scores will be dropped. Make-ups will not be permitted unless you have documented medical or other serious excuses for more than two exercise dates.
- **Quizzes:** 100 points. Quizzes will be 20 minutes long, scheduled every second Tuesday, beginning September 11. If there are no “snow days”,

there will be 7 quizzes. The lowest two scores will be dropped. Make-ups will not be permitted unless you have documented medical or other serious excuses for more than two quiz dates.

- **Final Exam:** Thursday, December 13, 8-10am. 150 points. **If you miss the final exam ...** due to illness or emergency, it is your responsibility to contact me promptly to receive permission to take a make-up exam; if possible, leave a message for me *before* the exam takes place. For a make-up exam, you will need written documentation of the emergency or illness (e.g., a note from your physician saying that you were incapacitated during the exam).

Regrades: If you think a mistake has been made in grading your work, submit it for regrading within two weeks of the date on which the work was returned to the class. After that, the grade will be considered final. Keep all of your papers in case there is any question about recording of grades.

Academic Integrity:

- All files within the class accounts are subject to inspection, and the campus code of computer conduct must be followed.
- All work that you submit in this course must be your own; group efforts will be considered academic dishonesty. See <http://www.studenthonorcouncil.umd.edu/code.html> for definitions and sanctions.
- You may discuss homework in general way with other students, but you may not consult any one else's written work, program drafts, computer files, etc. (Consult the instructor or the TA with specific questions about your work.) Any marked similarity in form or notation between submissions with different authors will be regarded as evidence of academic dishonesty – so protect your work.
- You are free to use reference books and websites to help you with assignments, but you must cite any reference you use. Such citation will not lower your grade.

Disability: If you need academic accommodations, please provide a letter of accommodation from the Office of Disability Support Services (DSS) within the first two weeks of the semester.

COURSE OUTLINE

1. Introduction, Computer Arithmetic and Errors (Notes) (approx. 4 lectures)
 - course survey
 - machine arithmetic
 - error analysis
 - stability and conditioning
2. Interpolation (Chapters 2-3) (approx. 5 lectures)
 - polynomial interpolation in two bases
 - piecewise polynomial interpolation
 - spline interpolation
3. Integration (Chapter 4) (approx. 3 lectures)
 - elementary integration formulas (midpoint, trapezoid, etc.)
 - compound and adaptive integration formulas
4. Matrix Computations (Chapter 5) (approx. 3 lectures)
5. Solving Linear Systems of Equations (Chapter 6) (approx. 4 lectures)
 - Gaussian elimination
 - well-conditioning vs. ill-conditioning, matrix and vector norms
 - sparse systems: direct and iterative methods
6. Solving Linear Least Squares Problems (Chapter 7)(approx. 3 lectures)
 - data-fitting and least squares
 - QR factorization
7. Solving Nonlinear Systems of Equations (Chapter 8)(approx. 3 lectures)
 - bisection, Newton's method, and secant method
 - methods for systems of equations
8. Ordinary Differential Equations (Chapter 9) (approx. 4 lectures)
 - ordinary differential equations and Euler's method
 - adaptive methods for ordinary differential equations
 - methods for stiff systems