

NUMERICAL METHODS. CS3414

<http://courses.cs.vt.edu/~cs3414/onufriev>

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Prerequisites:

CS1044, MATH2214, MATH2224, basic programming skills.

Topics:

1. Machine arithmetic and associated errors.
2. Taylor series (review).
3. Roots of equations.
4. Minimization of functions.
5. Intro into "real world" numerical packages: Mathematica, GSL, Numerical Recipes in C
6. Efficient Programming practices.
7. Interpolation: polynomial, splines.
8. Least squares. Extrapolation.
9. Basics of mathematical modeling.
10. Solutions of ordinary differential equations.
11. Advanced topics (if time permits).

Text (Required):

Cheney and Kincaid, "*Numerical Mathematics and Computing*", 7th Edition.

Other useful resources:

Press *et al.* "*Numerical Recipes in C*", Cambridge University Press, 2000.

Kahaner, Moler and Nash "*Numerical methods and software*", Prentice-Hall, 1989.

Hamming "*Numerical methods for Scientists and Engineers*", Dover, 1986.

Glynn *et al.* "The beginner's guide to Mathematica, (4th or 3rd edition).

Grading

Grade = mid-terms + quizzes (~ 33 %) + final (~ 33 %) + homework (~ 34 %). The % contribution is very approximate; the final grade is determined by the total score, normalized to 100. I use the following conversion to letter grade: A: score ≥ 90 , A-: score ≥ 85 , B+: score ≥ 80 , etc. in the decrements of 5. Attendance is not mandatory. However, unless the student has had considerable exposure to numerical calculations before, I strongly recommend that he/she comes to most lectures. Extra credit will be given for active in-class participation and other extra projects, some of which will be advanced. Extra credit will be used at instructor's discretion to improve borderline grades. A good amount of extra credit is usually helpful.