

# NUMERICAL METHODS. CS3414

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

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## Prerequisites:

CS1044, MATH2214, MATH2224, C or C++, rudimentary UNIX.

## 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. 7. Interpolation.
8. Least squares.
9. Numerical Integration.
10. Systems of linear equations (review of linear algebra included).
11. Advanced topics (Differential equations, etc.) (if time permits).

## Text (Required):

Cheney and Kincaid, *Numerical Mathematics and Computing*, Brooks & Cole, 2004.

## 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, (4<sup>th</sup> or 3<sup>rd</sup> edition ).

## Grading

Grade = mid-terms + quizzes (~ 33 %) + final (~ 33 %) + homework (~ 34 %). However, an excellent performance on all mid-terms, quizzes and the final will result in an "A" for the class regardless of homework. This rule applies only to students performing at solid "A" level in each and every mid-term, quiz and the final, and unless the student has had considerable exposure to numerical calculations before, I strongly recommend that he/she spends considerable time working out the homework assignments. Extra credit will be given for advanced level projects. Projects are due no later than one month before the final exam.