

**Instructor: Igor S Tolokh** (Torgersen 2160D, itolokh@vt.edu)

## Prerequisites:

CS1044, MATH2214, MATH2224, some programming, rudimentary UNIX (Linux) 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, GNU Scientific Library (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 Book (Required):

W.Cheney and D.Kincaid, “*Numerical Mathematics and Computing*”, 7th Edition, Brooks/Cole, 2013.

## Other useful resources:

Press W.H. *et al.* “*Numerical Recipes in C*”, Cambridge University Press, 2000.

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

K.E.Atkinson and W.Han “*Elementary Numerical Analysis*” (third edition), John Wiley and Sons, 2004.

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 (~ 34 %) + final (~ 33 %) + homework (~ 33 %).

Grades:  $\geq 90\%$   $\rightarrow$  A;  $\geq 85\%$   $\rightarrow$  A-;  $\geq 80\%$   $\rightarrow$  B;  $\geq 75\%$   $\rightarrow$  B-;  $\geq 70\%$   $\rightarrow$  C;  $\geq 65\%$   $\rightarrow$  C-; etc.

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 for advanced level projects. Projects are due no later than one month before the final exam. Extra credit will be used at instructor’s discretion to improve borderline grades.