

# **ACMS 60690 Numerical Analysis I, Fall 2014**

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## **Textbook**

There is no fixed textbook. Materials are chosen from different references below.

## **Course Description**

This is an introduction course for graduate students to learn fundamental concepts, theory and techniques in numerical analysis and scientific computing.

## **Topics**

- 1. Numerical Solution of Nonlinear Equations and Linear Systems**
- 2. Approximating Functions**
- 3. Numerical Differentiation and Integration**
- 4. Numerical Solution of Ordinary Differential Equations**
- 5. Numerical Solution of Partial Differential Equations**

**Prerequisites:** Calculus, Linear Algebra, Differential Equations, a programming language (Fortran or C or C++ or matlab, etc.)

## **References**

[1] Numerical Analysis: Mathematics of Scientific Computing, Third Edition, by David Kincaid and Ward Cheney, Brooks/Cole, ISBN: 0-534-38905-8, 2002. (The 2009 version by the American Mathematical Society (ISBN: 978-0-8218-4788-6) is the same.)

[2] Finite Difference Schemes and Partial Differential Equations, Second Edition, by John C. Strikwerda, SIAM, 2004, ISBN: 978-0-898716-39-9.

[3] Finite Difference Methods for Ordinary and Partial Differential Equations, by Randall J. LeVeque, SIAM, 2007, ISBN: 978-0-898716-29-0.

[4] J. Stoer, and R. Bulirsch, Introduction to Numerical Analysis, Springer, 2002.

[5] L. N. Trefethen, and D. Bau, Numerical Linear Algebra, SIAM, 1997.

[6] C.-W. Shu, Essentially Non-Oscillatory and Weighted Essentially Non-Oscillatory Schemes for Hyperbolic Conservation Laws, in Advanced Numerical Approximation of Nonlinear Hyperbolic Equations, B. Cockburn, C. Johnson, C.-W. Shu and E. Tadmor (Editor: A. Quarteroni), Lecture Notes in Mathematics, v1697, Springer, 1998.

## Other information

- **Office location:** Hurley Hall 176
- **Office phone:** (574) 631-6079
- **Office hours:** Tue 3pm – 4pm, or send me an email for an appointment.
- **Meeting time & place:** MWF 10:30am-11:20am, Pasquerilla Center 105 (Lecture)
- **Class website:** <http://www.nd.edu/~yzhang10/ACMS60690.html>
  
- **Homework:** Both theoretical and computational homework will be assigned regularly. Homework will be collected and graded.
  
- **Exams:** There will be one midterm exam and the final exam. Midterm exam will be the in-class exam. The final exam will be a take-home exam involving computer problems, or a combination of take-home exam and in-class exam.
  
- **Grades:** 35% homework, 20% midterm, 45% final exam. The final grade will be assigned by the total points as follows: **A+ ≥ 97, A ≥ 93, A- ≥ 90, B+ ≥ 87, B ≥ 83, B- ≥ 80, C+ ≥ 77, C ≥ 73, C- ≥ 70, D ≥ 60. Note: The cut-offs of grades are sharp. A+ will not be shown in your transcript.**
  
- **Honor Code:** Both examinations and homework are conducted under [the honor code](#). While cooperation in doing homework is permitted (and encouraged), copying is not.