Math 715: Numerical Analysis
Fall 2017

Department of Mathematical Sciences, UWM

Lecture Time and Place

5:00 PM - 6:15 PM, Monday and Wednesday, EMS 424A.

Instructor

Professor Dexuan Xie
Office: EMS, Room E422
Telephone: (414) 229-5103
E-mail: dxie@uwm.edu
Homepage: www.uwm.edu/~dxie
Office Hours: 10:30 AM – 11:30 AM, Monday and Wednesday

Computer Lab Place

EMS Building, Room E425.

Textbook

Lectures are given based on Instructor's teaching notes and the book: *Numerical Analysis,* L. Ridgway Scott, 2th edition, Princeton University Press. A copy of the book can be downloaded from D2L with the author's permission.

Prerequisite

Graduate students with basic knowledge of calculus, linear algebra, and differential equations.

Course Overview

- **Basic concepts on error analysis for algorithms.**
- **Numerical solution of nonlinear equations:** Fixed point iteration and Newton's methods.
- **Direct methods for solving linear systems:** Gaussian elimination, pivoting strategies, Cholesky algorithm, LU factorization.
- **Iterative methods for solving linear systems:** Jacobi iterative method, Gauss-Seidel iterative method, SOR method, and preconditioned conjugate gradient method.
- **Interpolation and polynomial approximation:** Lagrange polynomial, Chebyshev interpolation, Hermite interpolation, and approximation theory.
- **Numerical differentiation and integration:** Derivative approximation formulas, numerical integration formulas, and Gaussian quadrature.

- **Initial value problems for ordinary differential equations:** Euler's method, higher-order Taylor methods, Runge-Kutta methods, multistep methods, variable step size strategies, convergence, and stability analysis.

Grading

- Six homework evaluations: 60 %. Each for 10 %.
- Attendance: 10 %. 1 % reduction for one class missing.
- Final Exam: 30 %.
- Grading scale: A (90-100), B+ (86-89), B (80-85), C (70-79), D (60-69), F (below 59)

Important Dates

- September 6: First class
- October 2: Last day to drop without "W" on academic record.
- October 27: Last day to drop or withdraw.
- November 22-26: Thanksgiving Recess
- December 14: Last day of classes.
- December 18: Final Exam (5:00 PM to 7:00PM)

Homework:

The homework will be assigned on D2L.

Attendance:

Attendance is required. Each class missing is resulted in one point reduction. The maximum of class missing reduction points is 10. In other words, perfect attendance will gain 10 points of your course grade. Absences due to illness require a medical excuse on Physician's letterhead, signed by the physician. No makeup for the examination except for the exam missed for religious observance, military service, or illnesses (with a documented medical emergency).

Students with disabilities or who qualify for accommodations (VISA) should contact me early in the semester to discuss the assistance they may need.

Statement of Academic Misconduct

The university has a responsibility to promote academic honesty and integrity and to develop procedures to deal effectively with instances of academic dishonestly. Students are responsible for the honest completion and representation of their work, for the appropriate citation of sources, and for respect of others' academic endeavors. Further information can be found at http://www.uwm.edu/Dept/Acad_Aff/policy/academicmisconduct.html.

Statement of Discriminatory Conduct

Discriminatory conduct will not be tolerated by the University. It poisons the work and learning environment of the University and threatens the careers, educational experience, and well-being of students, faculty, and staff. The policy on discriminatory

conduct, including sexual harassment, can be found at:
https://www4.uwm.edu/secu/docs/other/S_47_Discrimina_duct_Policy.pdf