MATH 501, Spring 2019
(39694R)

Numerical Analysis and Computation

Instructors

Lecture: Dr. Chunming Wang
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Office Hours: MW 4:30PM – 6:00PM

Course Description

MATH501 is an introductory course for numerical analysis and scientific computing. On the theoretical side, this course provides an overview of numerical techniques for solving many important mathematical problems including solution of system of linear equations, solution of nonlinear equations, polynomial and spline interpolation, numerical integration, numerical methods for ordinary partial differential equations and numerical optimization problems. On the computational side, we use software such as Matlab to introduce the basic steps of implementing and validating algorithms for solving numerical mathematics problems. For most of graduate students in science and engineering disciplines, this class also offers a comprehensive review of mathematics for solving engineering and scientific problems.

Textbook and Reference

Germund Dahlquist and Åke Björck, Numerical Methods in Scientific Computing, Volume I, SIAM, 2008.

Ward Cheney and David Kincaid, Numerical Mathematics and Computing, 7th Edition, Brooks/Cole Thomson Learning 2013

Stoer**,** J., Bulirsch**,** R., Introduction to Numerical Analysis, 3rd ed. Springer-Verlag New York Inc., 2002.

Grading Policy

Homework: 25%, Projects: 20%, Midterm Exam: 25%, Final Exam: 30%.

1	Monday, January 7 Mathematics preliminaries	Wednesday, January 9 Mathematics preliminaries	Friday, January 11 Round-off error analysis
2	Monday, January 14 Direct methods for linear system of equations	Wednesday, January 16 Direct methods for linear system of equations	Friday, January 18 Matrix Factorization
3	Monday, January 21 Martin Luther King's Birthday	Wednesday, January 23 Iterative methods for linear system of equations	Friday, January 25 Iterative methods for linear system of equations
4	Monday, January 28 Eigenvalue problems	Wednesday, January 30 Eigenvalue problems	Friday, February 1 Eigenvalue problems
5	Monday, February 4 Least square problems	Wednesday, February 6 Monte-Carlo Methods	Friday, February 8 Monte-Carlo Methods
6	Monday, February 11 Monte-Carlo Methods	Wednesday, February 13 Monte-Carlo Methods	Friday, February 15 Midterm Exam
7	Monday, February 18 President's Day	Wednesday, February 20 Polynomial interpolation	Friday, February 22 Polynomial interpolation
8	Monday, February 25 Polynomial interpolation	Wednesday, February 27 Numerical differentiation	Friday, March 1 Numerical differentiation
9	Monday, March 4 Spline interpolation and approximation	Wednesday, March 6 Spline interpolation and approximation	Friday, March 8 Spline interpolation and approximation
10	Monday, March 18 Spline interpolation and approximation	Wednesday, March 20 Numerical integration	Friday, March 22 Numerical integration
11	Monday, March 25 Orthogonal polynomial	Wednesday, March 27 Orthogonal polynomial	Friday, March 29 Gaussian quadrature formula
12	Monday, April 1 Gaussian quadrature formula	Wednesday, April 3 Nonlinear Equations	Friday, April 5 Nonlinear Equations
13	Monday, April 8 Nonlinear Equations	Wednesday, April 10 Nonlinear Equations	Friday, April 12 Initial value problem
14	Monday, April 15 Initial value problem	Wednesday, April 17 Initial value problem	Friday, April 19 Initial value problem
15	Monday, April 22 Boundary value problem	Wednesday, April 24 Boundary value problem	Friday, April 26 Boundary value problem

** This is a tentative schedule. Adjustments are expected during the course of the semester.