MATH 574

Course: Math 574 Numerical Analysis II

Instructor : Young-Ju Lee

Office Hour : WED 3:00 pm - 4:00 pm or by appointment at Hill 238

Class : TTh 5:00 pm - 6:20 pm at Sec-117

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TA : Ping Lu and Yuzhong Zhang

Office Hour : TBA

Office : TBA

E-mail address : TBA

Text book:

1. A. Quarteroni, R. Sacco and F. Saleri, "Numerical Mathematics", 2nd Ed, Springer 2004
2. K. Atkinson, "An Introduction to Numerical Analysis", 2nd Ed, Wiley, 1989

Course Description:

574. Numerical Analysis II. This is the second part, independent of the first, of a general survey of the basic topics in numerical analysis. We shall study and analyze a number of numerical algorithms for approximating the solution of a variety of generic problems which occur in applications. The course will begin with the description of the solution methods for the linear system of equations. Starting from the direct methods based on the Gaussian elimination, various classical iterative methods such as Gauss-Seidel, Jacobi and SOR will be discussed. If time permits, we shall also study more advanced iterative methods, multigrid methods in this course, which is known to be most efficient iterative methods until now. Large portion of the course will be devoted to numerical techniques for optimization, matrix eigenvalues and eigenvectors and numerical solutions to nonlinear equations. As a separate but important technique, finite difference and finite element discretization methods for simple partial differential equations such as Poisson's equations and Heat equations will be studied at the end of the course. Particular emphasis in this course is to interconnect

the theorectical results and computer implementation. Students will study not only the solid theoretical backgrounds in developing and understanding the algorithms but also a hands-on experience to implement the methods.

Prerequisites:

Advanced Calculus, Linear Algebra, and familiarity with differential equations. Numerical Analysis 01:642:573 is desirable but not required.

Online component:

Homework assignment will not be distributed on paper in class but will be available as a pdf file on the course webpage. I will let you know when the homework is uploaded by e-mail.

Programming component:

Part of your work in this course will involve implementing numerical algorithms by using computer code. I will oftentimes make the code available to you in matlab programming language, and you will be able to use it with little modification. If you prefer a different programming language, you may write the code from scratch yourself.

Exams, Test Dates and Homeworks:

- Midterm I : Feb 17, 2011 (40%)
- Midterm II: Mar 24, 2011 (40%)
- Final Exam : TBA (45%)
- Homeworks (14%)
- Attendance (1%)

No Makeup Exams will be Allowed Unless an Exceptional Case Occurs

Grading Policy :

Average grade will be F, D, C, C+, B, B+ and A depending on whether the average is low or high. Your grade will depend on how far and in which direction your score is from the average.

Academic integrity statement : Academic dishonesty will not be tolerated in any form. See the link given in the course website for the university's policies. Cheating includes (but is not limited to) copying somebody else's homework, copying somebody else's quiz, copying somebody else's quiz corrections, copying somebody else's web posting, and stealing any materials related to this course. The definition of copying is more broad than verbatim duplicate. In other words, taking someone else's work or ideas and in any way passing them off as your own, even if you change the wording, is cheating.

Collaboration Policy:

1. Homework is an essential part of advanced mathematics courses. Most students will find that some problems will require repeated and persistent effort to solve. This process is an integral component of developing a mastery of the material presented, and students who do not dedicate the necessary time and effort towards this will compromise their performance in the exams in this course, and their ability to apply this material in their subsequent work.

2. A student may after working conscientiously on a problem for over 30 minutes, consult with other current students to develop and clarify their approach to the problem. The written solution should however be an independent and individual effort that reflects the student's understanding of the problem and its solution.

3. As a general guide, a student should be able to independently reproduce any solution that is submitted as homework. Copying of solutions is not permitted and will be considered a violation of these guidelines.

Calculators : Scientific and Graphing Calculators may not be used on the exams.