

DePaul University
Department of Mathematical Sciences
MAT 385-485/Numerical Analysis I/Syllabus
Winter Quarter 2006

Instructor: Dr. Abdallah M. Shuibi.

Office #: 535 SAC/Lincoln Park Campus.

Email: ashuibi@depaul.edu

URL: <http://condor.depaul.edu/~ashuibi/>

Phone #: (773)325-1349

Office Hours:

Monday 4:30PM - 5:30PM (*AND BY APPOINTMENT*).

Class Time and Place: Monday 5:45PM-9:00PM, 250 O'Connell/Lincoln Park Campus.

Prerequisite: MAT 262 and a Programming knowledge(C/C++, Maple, Matlab, Mathematica)

Text: *Numerical Mathematics and Computing* by Ward Cheney and David Kincaid(5th edition).

Course Description: This course is concerned with the understanding and application of algorithms for scientific computing. Among the topics that will be discussed in the course are computer arithmetic, Error Analysis, Gaussian elimination and Gauss Seidel Method, the solution of overdetermined systems by the least-squares method, approximation of integrals and derivatives, interpolation, solutions of linear and nonlinear systems of equations, and Monte Carlo methods. Numerous illustrations of how the numerical methods discussed work in practice will be provided. Several projects that require the development of software for scientific computing will be assigned. The programming language MATLAB will be taught and most of the computations will be carried out in Matlab. *MATLAB software is installed in GIS Lab (224 SAC) and QR Lab(SAC 268)*. Probably, most of our lectures will be given in the **GIS Lab**.

Class Operation:

1. Homework & Exams: From exercises in the text, and problems integrated with the lectures. One homework and programming assignment will be assigned each class and it will be due on the next class period. Homework and programming assignments will be posted on my Blackboard and/or my Website.
2. Final Exam: Comprehensive, during the regularly scheduled final exam period (*Monday, March 13, 2006, 5:45PM-8:00PM*).

Grading Policy:

- *Midterm Examination @ 30 %.*
- *Homework & Quizzes @ 15%.*
- *Programming Assignments @ 15%.*
- *Final Examination @ 40 %.*

Grading Scale:

(90 - 100)% **A**, (80 - 89)% **B**, (70 - 79)% **C**,

(60 - 69)% **D**, (0 - 59)% **F**.

Weekly Schedule:

1. [Jan 9] Introduction to *MATLAB*, Error Analysis and Taylor Series(1.1 & 1.2), Representation of Numbers in Different Bases(2.1).
2. [Jan16] Floating Point Representation(2.2), Loss of Significance(2.3), Bisection Method(3.1), Newton's Method(3.2), Secant Method(3.3).
3. [Jan23] Polynomial Interpolation(4.1), Errors in Polynomial Interpolation(4.2), Estimating Derivatives and Richardson Extrapolation(4.3).
4. [Jan30] Definite Integral(5.1), Trapezoid Rule(5.2), Simpson's Scheme(6.1), Gaussian Quadrature Formulas(6.2).
5. [Feb6] Naive Gaussian Elimination(7.1), Gaussian Elimination with Scaled Partial Pivoting(7.2).
..... [**Review & Midterm Examination**]
6. [Feb13] Matrix Factorization(8.1), Iterative Solutions of Linear Systems(8.2), Methods of Least Squares(12.1).
7. [Feb20] Orthogonal Systems and Chebyshev Polynomials(12.2).
8. [Feb27] Initial-Value Problem: Taylor Series Methods(10.1), Runge-Kutta Methods(10.2)[If time allows].
9. [Mar6] Monte Carlo Methods and Simulation (13.1, 13.2, & 13.3) [If time allows].
[**Review for Final Examination**]
10. [Mar13] [**Final Examination**]

GOOD LUCK
A. Shuibi