King Fahd University of Petroleum & Minerals
Department of Mathematical Sciences

MATH 321(111)

Course Syllabus

Course Instructor: Dr. Husain Al Attas

Recommended Text: "Numerical Methods Using Matlab" by J. Mathews & K. Fink, 4th Ed, Prentice Hall (2004)

Main Topics to be Covered: Error analysis , Solutions of Nonlinear Equations, Solution of Linear Systems, Interpolation and polynomial approximation, Curve fitting, Numerical differentiation and integration, Introduction to solution of initial and boundary value problems for ordinary differential equations.

Course Objectives: This course is designed to provide an introduction to numerical methods for solving a variety of problems, linear and nonlinear and numerical approximation. In this course we focus on both: the theoretical and computational aspects.

Students Learning Outcome: After completion of the course, the students should be able to

- Gain familiarity with a variety of methods used to solve/approximate problems.
- Be able to write computer programs to implement some numerical methods.
- Be aware of the theoretical basis upon which these numerical methods are built.
- Apply his knowledge to solve practical problems.

Computer Usage: Computer software is essential for this course. Mainly we will be using Matlab as the computational platform.

General Information

- The Final Exam is comprehensive
- Grading Policy: Homework 10%, Assignments 20%, Majors I and II 40%, Final30%
- Office Hours: S-M-W, 11:00-11:50 Office: 317 Building 5,
- Email: halattas@kfupm.edu.sa
- **Note**: KFUPM attendance policy will be enforced. DN grade for 9 and more unexcused absences.

Weekly Coverage of Course Material

Week	Date	Section	Topic	Suggested Homework
1	Sep. 10-14, 2011	1.3	Error Analysis	1,5,7,10,12,13
2	Sep. 17-21	2.1 2.2	Iteration for solving $x=g(x)$ Bracketing methods for locating a root	1,4,8,10 4,8,11,14
3	Sep. 25-28	2.3 2.4	Initial approximation and convergence criteria Newton-Raphson and secant methods	1,4 1,3,7,10,12,15,23
4	Oct. 1-5	3.4	Gaussian elimination and pivoting	14,15
5	Oct. 8-12	3.5	Triangular factorization	6,8,10
First Major Exam				
6	Oct. 15-19	3.6	Iterative methods for linear systems	8,11
7	Oct. 22-26	4.1 4.2	Taylor series and calculation of functions Introduction to interpolation	1,5,6,12,14 3
8	Oct. 29-31	4.3 4.4	Lagrange approximation Newton polynomials	2,6,12,13 8,11
Id al-Adha Vacation: Nov. 1-11, 2011				
9	Nov. 12-16	5.1	Least-squares line	2,4,9,11
10	Nov. 19-23	5.2 5.3	Methods of curve fitting Interpolation by spline functions	3,5,10,15,17,18 1,3,4,6,7,8,11,12
Second Major Exam				
11	Nov. 26-30	6.1 6.2	Approximating the derivative Numerical differentiation formulas	2,5,12,15 1,3,10,14
12	Dec. 3-7	7.1 7.2	Introduction to quadrature Composite trapezoidal and Simpson's rule	1,3 2,3,9,11,12
13	Dec. 10-14	7.3 7.4	Recursive rules and Romberg integration Adaptive quadrature	3,5,11 -
14	Dec. 17-21	9.1 9.2	Introduction to differential equations Euler's method	5,8,14 4,8
15	Dec. 24-28	9.5 9.8	Runge-Kutta methods Boundary value problems	2,4 1(a)
16	Dec. 31-Jan. 2, 2012		Review	