King Fahd University of Petroleum & Minerals
Department of Mathematical Sciences

MATH 321
Introduction to Numerical Computing
(Term 151)
Course Syllabus

Course Instructor: *Dr. Hattan Tawfiq*

Recommended Text: "Numerical Analysis" by Richard L. Burden, J. Douglas Faires 9th (2011)

Main Topics to be Covered:
Floating-point arithmetic and error analysis. Solution of non-linear equations. Polynomial interpolation. Numerical integration and differentiation. Data fitting. Solution of linear algebraic systems. Initial and boundary value problems of ordinary differential equations.

Course Objectives: This course is designed to introduce numerical methods for solving a variety of problems, linear, 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 familiar 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.
- be able to apply his knowledge in solving practical problems.

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

Attendance: KFUPM attendance policy will be enforced.

Grading Policy:

1. Two Major Exams (20% each)
2. Final Exam (35%) (Comprehensive)
3. Homework (10%)
4. MATLAB projects (10%)
5. Participation (in Class/ Online) (5%)

Academic Integrity: All KFUPM policies regarding ethics apply to this course.

Weekly Coverage of Course Material

Week	Sec.	Topic
1	1.1 1.2	Taylor Polynomials and Series Round-off Errors and Computer Arithmetic
2	1.3 -	Algorithms and Convergence MATLAB
3	2.1 2.2	The Bisection Method Fixed- Point Iteration
4	2.3	Newton's Method and its Extensions
5	3.1 3.3	Interpolation and the Lagrange Poly. Divided Differences
6	3.5	Cubic Spline Interpolation
7	4.1	Numerical Differentiation
8	4.3 4.4	Element of Numerical Integration Composite Numerical Integration
9	5.1 5.2	The Elementary Theory of I.V.P. Euler' Methods
10	5.3	Runge-Kutta Methods
11	6.1 6.2	Linear systems of Equation Pivoting Strategies
12	6.5	Matrix Factorization
13	7.3	The Jacobi and Gauss-Siedel Iterative Techniques
14	8.1	Discrete Least Squares Approximation
15	11.3	Finite-Difference Methods for Linear Problems
16		Review