

Department of Mathematics and Statistics
SYLLABUS 173

Course:	Math 371
Title:	Introduction to Numerical Computing
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 able to: <ol style="list-style-type: none"> 1. Use Taylor Series to approximate functions and evaluate the approximation errors. 2. Understand and program algorithms to locate the roots of equations. 3. Understand and program algorithms to solve linear system of equations. 4. Learn how to smooth collected engineering data using least squares method. 5. Use polynomials to interpolate collected engineering data or approximate function 6. Understand and program algorithms to evaluate the derivative or the integral of a given function and evaluate the approximation error involved. 7. Understand and program to solve engineering Ordinary Differential Equations (ODE) or Partial Differential Equations (PDE). 8. Understand relationships among methods, algorithms and computer errors. 9. Apply numerical and computer programming tools to solve common engineering problems.
Computer Usage:	Computer software is essential for this course. Mainly we will be using MATLAB as the computational platform.

Recommended Textbook	“Numerical Analysis” by Richard L. Burden, J. Douglas Faires 10th (2016).
Reference Textbook	“Numerical Methods for Engineers”, Steven C. Chapra and Raymond P. Canale. (6 th Edition).

Scheduled Meeting Times

section	Time	Location	Instructors
02	09:20Am - 10:20Am	Building #4 103	Yaqoub Shehadeh
04	10:30Am - 11:30Am	Building #4 103	

Office: 5-302 Tel: 860- 7006 E-mail: shhadeh@kfupm.edu.sa

Weekly Coverage of Course Material

Week	Dates	Sec.	Topic
1	Jun. 24 – Jun. 30	1.1 1.2 1.3 --	Taylor Polynomials and Series Round-off Errors and Computer Arithmetic Algorithms and Convergence Introduction to MATLAB
2	Jul. 1 – Jul. 5	2.1 2.2 2.3	The Bisection Method Fixed- Point Iteration Newton's Method and its Extensions
3	Jul. 8 – Jul. 12 Jul. 11	3.1 3.3 Ex1 3.5	Interpolation and the Lagrange Poly Divided Differences 7 pm to 9pm Cubic Spline Interpolation
4	Jul. 15 -- Jul. 19	4.1 4.3 4.4	Numerical Differentiation Element of Numerical Integration Composite Numerical Integration
5	Jul. 22 – Jul/ 26	5.1 5.2 5.4	The Elementary Theory of I.V.P. Euler' Methods Runge – Kutta Methods
6	Jul. 26 Jul. 29 – Aug. 2	Ex2 6.1 6.2 6.5	7 pm to 9 pm Linear systems of Equation Pivoting Strategies Matrix Factorization
7	Aug. 5 – Aug. 9	7.3 8.1	The Jacobi and Gauss-Siedel Iterative Techniques Discrete Least Squares Approximation
8	Aug.12	11.3	Finite-Difference Methods for Linear Problems

Grading Policy

Two Major Exams	20% each
Final Exam (Comprehensive)	30%
Classwork	15%
MATLAB projects	15%