King Fahd University of Petroleum and Minerals

Mathematics Department

MATH 471 Numerical Analysis I Syllabus, Term 221

Instructor: Dr. Said Algarni

Course Code: Math 471

Textbook: "Numerical Analysis" by Richard L. Burden, J. Douglas Faires 10th Edition (2016)

Reference:

1- Numerical Linear Algebra by Lloyd Trefethen and David Bau
2- Numerical Linear Algebra and Matrix Factorizations by Tom Lyche
3- Applied Linear Algebra by Peter Olver and Chehrzad Shakiban

The Course description: Floating-point, round-off analysis. Solution of linear algebraic systems: Gaussian elimination and LU decomposition, condition of a linear system, error analysis of Gaussian elimination, iterative improvement. Least squares and singular value decomposition. Matrix eigenvalue problems.

Computer usage: Computer software is an integral part of this course and mainly we shall use MATLAB as the computational platform.

The Course Learning Outcome: Upon completion of this course, students should be able to:

- Discuss Floating-Point arithmetic.
- Solve linear systems using computer software.
- Explain mathematical reasoning in algorithms.
- Develop error analysis of numerical methods.
- Recognize the role-play of singular value decomposition in solving least square problems.
- Calculate eigenvalues and eigenvectors of matrices using numerical techniques.

The Course Grading Policy: Exam1 22% + Exam2 22% + Final (comprehensive) 36% + HW & Assignment 20%

Attendance: 9 unexcused absences will result in a DN grade.

Academic Integrity: All KFUPM policies regarding ethics apply to this course. See the Undergraduate Bulletin.

Weekly Coverage of Course Material

Week	Date	Sec.	Topic
1	Aug. 28	1.1	Taylor Polynomials and Series
2	Sep. 04	1.2 1.3	Round-off Errors and Computer Arithmetic Algorithms and Convergence
3	Sep. 11	6.1 6.2	Linear systems of Equation Pivoting Strategies
4	Sep. 18	6.3 6.4	Linear Algebra and Matrix Inversion The Determinant of a Matrix
5	Sep. 25	6.5 6.6	Matrix Factorization Special Types of matrices
6	Oct. 02	7.1 7.2	Norms of Vectors and Matrices Eigenvalues and Eigenvectors
7	Oct. 09	7.3	The Jacobi and Gauss-Siedel Iterative Technique
8	Oct. 16	7.4 7.5	Relaxation Techniques for Solving Linear System Error Bounds and Iterative Refinement
9	Oct. 23	8.1	Discrete Least Squares Approximation
10	Oct. 30	8.2	Orthogonal Polynomials and Least Squares Approximation.
11	Nov. 06	9.1 9.2	Linear Algebra and Eigenvalues Orthogonal Matrices and Similarity Transformations
12	Nov. 13	9.3	The Power Method
13	Nov. 20	9.4	Householder's Method
	Nov. 27	Midterm Break	
14	Dec. 04	9.5	The QR Algorithm
15	Dec. 11	9.6	Singular Value Decomposition