College of Engineering

Department of Civil Engineering

جـــامـــعـــة
الملك سعود
King Saud University | 1957

MATH 505   Numerical Linear Algebra

Credit and Contact hours	3 / 3 (Lectures), 0 (Tutorials), 0 (Laboratory)
Required, or Elective	Required
Course Description	Linear equations and matrix analysis approximation of functions, error analysis, special matrices, error analysis for linear systems, iterative methods, computation of Eigen values and Eigen vectors.
Prerequisites or Co-requisites	None

Course Learning Outcomes	Students completing this course successfully will be able to:	
	Course Learning Outcomes (CLOs)	*Related Student Outcomes (SO)*
	CLO1. Recognize Basic concepts and types of linear systems. K1	**SO1**
	CLO2. Formulate systems of linear equations. K1	**SO1**
	CLO3. Use Direct and indirect numerical methods. K1	**SO1**
	CLO4. Apply Error estimate for system of linear equations. K1	**SO1**
	CLO5. Realize real-world problems that require allowing for random effects. S1	**SO2**

Student Outcomes related to this Course	SO 1 Recognize advanced engineering knowledge, concepts, and techniques to identify, interpret, and analyze complex and real-life engineering problems. SO 2 Provide solutions for complex and real-life engineering problems through critical thinking and the use of modern engineering tools, and identify their impact on social, global, cultural, environmental, safety, and economic factors.

Topics Covered	**List of Topics**	**Related CLOs**
	1. Basic concepts of Numerical Methods solving system of linear equations.	**CLO 1**
	2. Existence and uniqueness results. Special matrix approach.	**CLO 2**
	3. Direct and iterative method for solving linear systems	**CLO 3**
	4. Error estimate and conditioning of system of linear equations.	**CLO 4**
	5. Solving eigenvalues problems using direct and iterative numerical methods	**CLO 5**
	6. Approximation of the functions using least squares approximation	**CLO 5**

Textbook(s) and Other Required Material	- Applied Linear Algebra using MATLAB, Pages: 518, Heldermann Verlag Press, (2008), by R. Butt. - Numerical Linear Algebra and Optimization using MATLAB, Pages: 1160, Mercury Learning and Information, (2011), by R. Butt. - An Introduction to Applied Numerical Linear Algebra Using MATLAB; Pages: 642, Alpha Science International Ltd., Oxford, United Kingdom, (2015), by R. Butt.	
Grading System	Homework and Tutorial Activities	10%
	First Midterm Exam	25%
	Second Midterm Exam	25%
	Final Exam	40%
Instructors	To be set by College of Science	
Date of Review	November, 2024	