National University of Sciences & Technology (NUST)

Linear Algebra

Course Code:	Math-222	**Semester:**	3rd
Credit Hours:	3+0	**Prerequisite Codes:**	None
Instructor:	Mr. Saeed Afzal	**Class:**	BSCS-12ABC
Office:	304	**Telephone:**	
Lecture Days:	Monday, Tuesday, Thursday	**E-mail:**	Saeed.afzal@seecs.edu.pk
Class Room:	20,21	**Consulting Hours:**	Wednesday 9:00am-12:00pm,2:30pm-4:00pm,Friday 9:00am-12:00pm
Lab Engineer:		**Lab Engineer Email:**	
Knowledge Group:	Linear Algebra	**Updates on LMS:**	After every lecture

Course Description:

The course reviews the basic concepts; including Matrices, Determinants, and linear system of equations. Stress is laid on vector spaces, inner product spaces and Eigenvalue problems with applications circuit analysis, computer graphics, control theory, and resonance and vibration theory of differentiation and integration to practical problems.

Course Objectives:

The successful completion of the course should develop the ability to select an appropriate and efficient method for solving linear system of equations and handling the Eigenvalue problems which are extensively studied for example in resonance and vibration theory.

Course Learning Outcomes (CLOs):

At the end of the course the students will be able to:	PLO	BT Level*
CLO1: Solve the system of linear equations using matrices and determinants.	3	C-3
CLO2: Explain concept of vector spaces, Linear Transformations and applications.	1	C-2
CLO3: Apply the concept of Eigenvalues and diagonalization to solve engineering applications.	3	C-3

* BT= Bloom's Taxonomy, C=Cognitive domain, P=Psychomotor domain, A= Affective domain

Mapping of CLOs to Program Learning Outcomes

PLOs/CLOs	CLO1	CLO2	CLO3
PLO 1 (Academic Education)		√	
PLO 2 (Knowledge for Solving Computing Problems)			
PLO 3 (Problem Analysis)	√		√
PLO 4 (Design/ Development of Solutions)			
PLO 5 (Modern tool usage)			
PLO 6 (Individual and Team Work)			
PLO 7 (Communication)			
PLO 8 (Computing Professionalism and Society)			
PLO 9 (Ethics)			
PLO 10 (Life-long Learning)			

Mapping of CLOs to Assessment Modules and Weightages (In accordance with NUST statutes)

To be filled in at the end of the course.				
Assessments/CLOs	CLO1	CLO2	CLO3	CLO4
Quizzes: 10%				
Assignments: 10%				
Mid Term: 30%				
End Semester Exam:50%				
Total : 100 %				

Books:

Text Book:	• Advanced Engineering Mathematics, (9th Edition) by Erwin Kreyszig, John Wiley and Sons, inc 2006
Reference Books:	• Introductory Linear Algebra (7th Edition) by B. Kolman, David R Hill Pearson Education (Singapore) 2003. • Introduction to Linear Algebra with applications by Daniel Gagliardi and Jim DeFranza . • Linear algebra with modern introduction by David Poole. • Linear Algebra with Applications (6th Edition) by Gareth Williams, Jones and Bartlett 2008. • Linear Algebra with applications by Steven J Leon. • Modern Engineering Mathematics by Glyn James.

Lecture Breakdown:

	Topic
Week 1	Introduction to Matrices: Addition, multiplication, Special Matrices and applications.
Week 2	Linear System of Equations, Gauss Elimination, Row Echelon Form with application.
Week 3	Solutions of Linear Systems: Existence, Uniqueness. Homogeneous and non-homogeneous Equations
Week 4	Determinants and Crammer's Rule, Inverse of a Matrix, Gauss-Jordan Elimination, Determinant of Matrix Product.
Week 5	Linear Systems: LU –Factorization, Solution of Linear Systems by LU-Factorization.
Week 6	Applications of matrix algebra in computer science, Introduction of Vector space
Week 7	Rank of a Matrix, Linear Dependence & Independence, Subspaces, Basis and Dimension.
Week 8	Eigenvalues and Eigen Vectors. Applications of Eigenvalues and Eigen Vectors.
Week 9	**Mid Term**
Week 10	Symmetric, Skew Symmetric and Orthogonal Matrices.
Week 11	Eigen-bases. Diagonalization. Quadratic Form
Week 12	Complex Matrices and Forms: Hermitian, Skew-Hermitian and unitary matrices.
Week 13	Linear Transformation and Matrices

Week 14	The Kernel and Range of Linear Transformation
Week 15	N-vectors, Vector Operations and Visualizing R3 with applications. Inner Product Spaces, norm of a vector
Week 16	Inner Product Spaces, norm of a vector ,orthogonal vectors and inner product on Cn.Least Square Curves.
Week 17	Least Square Curves.
Week 18	**ESE**

Tools / Software Requirement:
Matlab could be used for calculations.

Grading Policy:

Quiz Policy:	The quizzes will be unannounced and normally last for ten minutes. The question framed is to test the concepts involved in last few lectures. Number of quizzes that will be used for evaluation is at the instructor's discretion. Grading for quizzes will be on a fixed scale of 0 to 10. A score of 10 indicates an exceptional attempt towards the answer and a score of 1 indicates your answer is entirely wrong but you made a reasonable effort towards the solution. Scores in between indicate very good (8-9), good (6-7), satisfactory (4-5), and poor (2-3) attempt. Failure to make a reasonable effort to answer a question scores a 0.
Assignment Policy:	In order to develop comprehensive understanding of the subject, assignments will be given. Late assignments will not be accepted / graded. All assignments will count towards the total (No 'best-of' policy). The students are advised to do the assignment themselves. Copying of assignments is highly discouraged and violations will be dealt with severely by referring any occurrences to the disciplinary committee. The questions in the assignment are meant to be challenging to give students confidence and extensive knowledge about the subject matter and enable them to prepare for the exams.
Plagiarism:	SEECS maintains a zero tolerance policy towards plagiarism. While collaboration in this course is highly encouraged, you must ensure that you do not claim other people's work/ ideas as your own. Plagiarism occurs when the words, ideas, assertions, theories, figures, images, programming codes of others are presented as your own work. You must cite and acknowledge all sources of information in your assignments. Failing to comply with the SEECS plagiarism policy will lead to strict penalties including zero marks in assignments and referral to the academic coordination office for disciplinary action.