National University of Sciences & Technology (NUST)
School of Electrical Engineering and Computer Science (SEECS)
Department of Electrical Engineering

Linear Algebra

Course Code:	Math-222	**Semester:**	Third
Credit Hours:	3+0	**Prerequisite Codes:**	None
Instructor:	**Dr. Hina M. Dutt**	**Class:**	BSCS-6ABC
Office:	A-303	**Telephone:**	051-90852363
Lecture Days:	Mon, Wed, Thursday	**E-mail:**	hina.dutt@seecs.edu.pk
Class Room:		**Consulting Hours:**	
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*
1. Solve system of linear equation, vector spaces and linear transformation.	1	C-3
2. Apply the concept of Eigen values, Eigen vector to model related problems.	2	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
PLO 1 (Engineering Knowledge)	√	
PLO 2 (Problem Analysis)		√
PLO 3 (Design/Development of Solutions)		
PLO 4 (Investigation)		
PLO 5 (Modern tool usage)		
PLO 6 (The Engineer and Society)		
PLO 7 (Environment and Sustainability)		
PLO 8 (Ethics)		
PLO 9 (Individual and Team Work)		
PLO 10 (Communication)		

PLO 11 (Project Management)		
PLO 12 (Lifelong 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%				
OHT-1: 15%				
OHT-2: 15%				
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 (7thEdition) by B. Kolman, David R Hill Pearson Education (Singapore) 2003.
- Linear Algebra with Applications(6th Edition)by Gareth Williams, Jones and Bartlett 2008
- Differential Equations (3rd Edition) by Dennis G. Zill and Michael Cullen
- 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	**OHT-1**
Week 8	Rank of a Matrix, Linear Dependence & Independence, Subspaces, Basis and

	Dimension.
Week 9	Eigenvalues and Eigen Vectors. Applications of Eigenvalues and Eigen Vectors.
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	**OHT-2**
Week 14	Linear Transformation and Matrices
Week 15	The Kernel and Range of Linear Transformation
Week 16	n-vectors, Vector Operations and Visualizing R3 with applications.
Week 17	Inner Product Spaces, norm of a vector, orthogonal vectors and inner product on Cn
Week 18	Least Square Curves
Week 19	**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.