



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:	3 rd
Credit Hours:	3+0	Prerequisite Codes:	None
Instructor:	Shahid Saqlain	Class:	BESE
Office:		Telephone:	03005331018
Lecture Days:	Monday, Tuesday, Wednesday	E-mail:	saqlainzahid@gmail.com
Class Room:	8	Consulting Hours:	Monday 1300-1400 Wednesday 0900-1000
Lab Engineer:		Lab Engineer Email:	
Knowledge Group:	Linear Algebra	Updates on LMS:	After every week

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 problems of Matrices and determinants.	1	C-3
2. Solve system of linear equation using matrices.	1	C-3
3. Understand and utilizing the concepts of Vector Spaces.	1	C-2
4. Solve Eigen values, Eigen vector and related problems.	1	C-3
5. Solve problems related to Linear Transformations and its applications.	1	C-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	Level of Emphasis of PLO (1: High, 2: Medium, 3: Low)	CLO1	CLO2	CLO3	CLO4	CLO5
PLO 1 (Engineering Knowledge)	3	√	√	√	√	√
PLO 2 (Problem Analysis)						
PLO 3 (Design/Development of Solutions)						



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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	CLO5
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 (7th Edition) 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:



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	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	Vector Spaces, Rank of a Matrix, Linear Dependence & Independence.
Week 5	Determinants and Cramer's Rule, Inverse of a Matrix, Gauss-Jordan Elimination, Determinant of Matrix Product.
Week 6	OHT-1
Week 7	Eigenvalues and Eigen Vectors. Applications of Eigenvalues and Eigen Vectors.
Week 8	Symmetric, Skew Symmetric and Orthogonal Matrices.
Week 9	Eigenbases. Diagonalization. Quadratic Form
Week 10	Complex Matrices and Forms: Hermitian, Skew-Hermitian and unitary matrices .
Week 11	Linear Transformation and Matrices
Week 12	OHT-2
Week 13	The Kernel and Range of Linear Transformation
Week 14	n-vectors, Vector Operations and Visualizing R ³ with applications.
Week 15	Inner Product Spaces, norm of a vector, orthogonal vectors and inner product on C ⁿ
Week 16	Linear Systems: LU –Factorization, Solution of Linear Systems by LU-Factorization.
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



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penalties including zero marks in assignments and referral to the academic coordination office for disciplinary action.