Linear Algebra

Course Code:

MATH 221

Course Period:

Autumn

Course Type:

Core

Credits:

3

Theoric:

4

Practice:

0

Laboratory Hour:

0

ECTS:

6

Course Language:

English

Course Objectives:

To introduce the basic topics of Linear Algebra to engineering students.

Course Content:

Systems of Equations, Matrices, Determinants, Vector Spaces, Linear Transformations, Orthogonality, Eigenvalues

Course Methodology:

1: Lecture

Course Evaluation Methods:

A: Written examination

Learning Outcomes	Program Outcomes	Teaching Methods	Assessment Methods
1) Solve linear equations using Gauss or Gauss-Jordan elimination method.	1	1	A
2) Know matrix algebra, compute the inverse of a non-singular matrix using elemntary matrices, LU-decompose a square matrix.	1	1	A
3) Compute the determinant of a square matrix, Apply Cramer's rule	1	1	A
4) Know the definition and basic examples of vector spaces, subspaces, linear independence, spanning set, basis and dimension. Know the definition and basic properties of linear transformations, Compute the matrix representation of a linear map with respect to fixed ordered-bases	1	1	A
5) Know inner-product spaces and apply Gramm-Schmidt orthogonalization process.	1	1	A
6) Compute eigenvalues and eigenvectors and know diagonalization.	1	1	A

Topics	Study Materials	
1	Systems of Linear Equaitons, Row Echelon Form	1.1, 1.2
2	Matrix Arithmatic, Matrix Algebra	1.3, 1.4
3	Elementary Matrices, Partitioned Matrices	1.5, 1.6
4	Determinant of a Matrix, Properties of Determinant	2.1, 2.2
5	Cramer's Rule	2.3
6	Vectors, Subspaces	3.1, 3.2
7	Linear Independence, Basis and Dimension	3.3, 3.4

8	Change of Basis, Row Space and Column Space	3.5, 3.6
9	Linear Transformations, Matrix Representation of Linear Transformations	4.1, 4.2
10	Similarty	4.3
11	The Scalar Product in R^n, Orthogonal Subspaces	5.1, 5.2
12	Orthanormal Sets	5.5
13	The Gram Schmidt Orthoganilization Process	5.6
14	Eigen Values and Eigen Vectors, Diagonalization	6.1, 6.3

Textbook	“Linear Algebra With Applications” Stevan J. Leon 8th Eddition 2010 (Pearson Prentice Hall)
Additional Resources	

Documents	
Assignments	
Exams	

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Mid-term	1	100
Total		**100**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		60
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		40
Total		**100**

COURSE'S CONTRIBUTION TO PROGRAM							
No	Program Learning Outcomes	Contribution					
		1	2	3	4	5	

1	Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline; ability to use theoretical and applied information in these areas to model and solve engineering problems.					X	
2	Ability to identify, formulate, and solve Electrical and Electronics Engineering problems; ability to select and apply proper analysis and modeling methods for this purpose.						
3	Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result; ability to apply modern design methods for this purpose.						
4	Ability to devise, select, and use modern techniques and tools needed for engineering practice; ability to employ information technologies effectively.						
5	Ability to design and conduct experiments, gather data, analyze and interpret results for investigating engineering problems						
6	Ability to access information; For this purpose ability to perform database searching and conduct literature review.						
7	Ability to work efficiently in intra-disciplinary and multi-disciplinary teams; ability to work individually.						
8	Ability to communicate effectively both orally and in writing; knowledge of a minimum of one foreign language.						
9	Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to continue to educate him/herself.						
10	Awareness of professional and ethical responsibility.						
11	Information about business life practices such as project management, risk management, and change management; awareness of entrepreneurship, innovation, and sustainable development.						
12	Knowledge about contemporary issues and the global and societal effects of engineering practices on health, environment, and safety; awareness of the legal consequences of engineering solutions.						

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)

Course Duration (14x Total course hours)	14	4	56
Hours for off-the-classroom study (Pre-study, practice)	14	5	70
Mid-terms (Including self study)	1	14	14
Final examination (Including self study)	1	10	10
Total Work Load			150
Total Work Load / 25 (h)			6
ECTS Credit of the Course			6