



HANYANG UNIVERSITY

Hanyang International Summer School

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	Home University	Hanyang University				
	Department	School of Mechanical Engineering				
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Course Information	Class No.	TBA	Course Code	DME2060	Credits	3
	Course Name	Linear Algebra and Its Applications				
	Lecture Schedule	Monday-Saturday / 13:00~16:00				
	Course Description	<p>Modern engineering problems use computer simulation techniques as solutions, and most of these computational solvers are based on linear algebra. Linear algebra provides a systematic solution along with a theoretical understanding of the system composed by linear equations, which can be directly connected to computational solvers. Therefore, linear algebra is essential in order to efficiently and quickly solve engineering problems dealing with large-scale unknown variables using computers. Therefore, this lecture will provide the concepts of linear equations and their solutions, properties of matrices and vectors, linear independence (or linear independence, basis, eigenvalue and eigenvector. Based on these fundamentals, its applications for artificial intelligence and machine learning will be also covered in this class.</p>				
	Course Objective	<ol style="list-style-type: none"> 1. Concepts of linear equations and their solutions 2. Properties of matrices and vectors 3. Linear independence and basis 4. Eigenvalue and eigenvector 5. Singular Value Decomposition 6. Understanding applications for AI 				
	Prerequisite	-				
	Materials/Textbooks	Linear algebra and its applications (4th edition), Gilbert Strang				
Evaluation	Attendance	10%	Quiz	%		
	Assignment	10%	Mid-term Exam	40%		
	Presentation	%	Final Exam	40%		
	Group Project	%	Participation	%		



	Etc.		Evaluation Item	Ratio
				%
				%
Daily Lecture Plan	Day 1	1.1 Linearity and Linear Algebra		
	Day 2	1.2-1.4 Matrices and Gaussian Elimination 1.5 Triangular Factors and Row Exchanges		
	Day 3	1.6 Inverse and Transposes 2.1 Vector Spaces and Subspaces		
	Day 4	2.2 Solving $Ax = 0$ and $Ax = b$ 2.3 Linear Independence, Basis, and Dimension		
	Day 5	2.4 The Four Fundamental Subspaces 2.5-2.6 Linear Transformations		
	Day 6	3.1 Orthogonal Vectors and Subspaces 3.2-3.3 Projections and Least Squares		
	Day 7	3.4(1) Orthogonal Bases and Gram-Schmidt 3.4(2) QR Factorization		
	Day 8	Mid-term exam		
	Day 9	4.1 Introduction to Determinants 4.2 Properties of Determinant		
	Day 10	4.3 Formulas for the Determinant 4.4 Applications of Determinants		
	Day 11	5.1 Eigenvalues and Eigenvectors 5.2 Diagonalization of a Matrix		
	Day 12	5.3 Difference Equations and Powers A^k 5.4 Differential Equations and e^{At}		
	Day 13	5.5-5.6 Complex Matrices & Diagonalization of Symmetric Matrices		
	Day 14	6.3 Singular Value Decomposition		
	Day 15	Final exam		