HANYANG UNIVERSITY

Hanyang International Summer School

Faculty Information	**Name**	Jiwoong Bae				
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Course Information	**Class No.**	18086	**Course Code**	DME2060	**Credits**	3
	Course Name	Linear Algebra and Its Applications				
	Lecture Schedule	Monday-Saturday / 13:00~16:00				
	Course Description	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.				
	Course Objective	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