Course Code	TKIE161203
Course Name	Linear Algebra
Course Instructors	Adha Imam Cahyadi; D. Dony Arianandа
Course Type	Required
Course Classification	Basic Science & Math
Credit / Contact Hour per Week	3 / 150 minutes per Week
Course Description	This course discusses vector and matrix theory, its role as presentations of geometry, and how this theory can be used to solve mathematical model. The mathematical model can generally be formulated based on some engineering problems.
Prerequisites Courses	-
Covered Student Outcome	**Fundamental and Engineering Knowledge (a)** **Development of Engineering Solution (b)**

Learning Outcome	1. Students are able to explain the concept of vectors and matrices as well as matrices operation, able to solve mathematical problems involving vectors and matrices, and able to interpret this concept from geometrical perspective. 2. Students are able to explain the relationship between the process of solving linear equations with matrix elimination (Gauss elimination, Gauss-Jordan elimination, and LU factorization) and able to solve systems of linear equations using the aforementioned elimination methods. 3. Students are able to explain the concepts of vector spaces and subspaces, able to interpret this concepts from the geometrical perspective, and able to apply this intuition from the geometrical perspective to solve related problems. 4. Students are able to explain the concepts of orthogonality and projection as well as able to solve the problems of projecting a vector into a particular subspaces by exploiting both least-square and Gram-Schmidt methods. 5. Students are able to explain the property of the determinant of a matrix, able to explain how to compute the determinat of a matrix, able to apply determinant to solve invers problems and system of linear equations. 6. Students are able to explain the concepts of eigenvalues, eigenvectors, and singular value decompositions (SVD), able to explain how to compute eigenvalue decomposition of a square matrix and the SVD of a matrix.
Topic	1. Introduction to Vectors and Matrices, Dot and Cross Products 2. Solving System of Linear Equations 3. Gauss Elimination, Gauss-Jordan Elimination, LU Factorization 4. Vector Spaces and Subspaces. 5. The four important subspaces and their relationship to system of linear equations 6. The rank of a matrix, the concepts of basis and dimenions, and their relationship with the column space and row space. 7. Orthogonality and Projections 8. Gram Schmidt and QR Factorization 9. Least Squares Approximation 10. The Concept of Determinants 11. Eigenvalues, Eigenvectors, Diagonalization and Eigenvalue Decomposition. 12. Symmetric Matrices, Positive (Semi) Definite Matrices, and Orthogonal Diagonalization 13. Singular Value Decomposition
Direct Asessment	

Direct Asessment Plan	**Measured Learning Outcome**
Homework 1	LO1
Homework 2	LO2
Homework 3	LO3
Homework 4	LO4
Homework 5	LO5

	Homework 6	LO6
	Mid Exam	LO1, LO2, LO3
	Final Exam	LO4, LO5, LO6
Indirect Assesment	Questionnaire (EDOM)	
References	[1] Strang, G. (2009). Introduction to Linear Algebra (4ed). Cambridge: Wellesley Cambridge Press. [2] Poole, D. (2006). Linear Algebra: A Modern Introduction (2ed). Pacific Grove: Brooks-Cole Publishing. [3] Strang, G. (2006). LinearAlgebra and its Applications (4ed).Cambridge: Wellesley Cambridge Press. [4] Lay, D.C, Lay, S.R., & Mc. Donald, J.J., (2007). Linear Algebra and its Application. London:Pearson Education.	