Linear Algebra

Module name	Linear Algebra	
Module level	Undergraduate	
Code	IF221109	
Courses (if applicable)	Linear Algebra	
Semester	2	
Lecturer	Dr. Ir. Kartini, S.Kom, MT. (PIC) Andreas Nugroho S, S.Kom, M.Kom. Henni Endah Wahanani, S.T, M.Kom. M. Muharrom A.H, S.Kom., M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 2nd semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	simulation, case study, collaborative learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Computational Mathematics	
Courses description	In this course, students learn how to solve the system linear equations (SLE) problem using a computational matrix. SLE can be done using Gaussian elimination, Gauss-Jordan elimination and Cramer's rules. In order to better understand the material for the students, it needs to be implemented into a particular programming language. Matrix operation problem begins with the determinant and continues with the inverse matrix. The determinant can be done using Elementary Row Operations (ERO) and cofactor. Inverse matrix can be done using ERO, cofactors and Pseudo-inverse. Implementations to the program are also required to make students more proficient. In vector space, students learn field equations, parametric equations, symmetric equations, dot product, cross product, and linear transformations. Basis include spans, linear independent, homogeneous linear equations, old basis and new basis, the general solution, basis row space, basis column space, orthonormal bases, gram schmidt. Next is about eigenvalues, students learn about eigenvalue and eigenvector, diagonalization, orthogonal diagonalization (practice using the program). In order to further explore the material, case examples of linear algebra will be given.	
Learning outcomes and their	After completing this module, a student is expected to:	
	CO1 Students are able to understand and apply concepts of linear equations, matrices, and vectors, and being able to solve related problems accurately and correctly.	PLO5

corresponding PLOs	**CO2** Students are able to understand and apply the concepts of Vector Spaces, Linear Transformations, Eigenvalues, and Eigenvectors, and being able to solve related problems accurately and correctly.	PLO5
Content	● System Linear Equations; Gaussian elimination, Gauss-Jordan elimination and Cramer's rules (using program). ● Matrix and operation, determinant, determinant using Elementary Row Operations (ERO) and cofactor. ● Invers matrix using ERO, cofactors and pseudo-inverse. ● Vector space, field equations, parametric equations, symmetric equations, dot product, cross product, and linear transformations. ● Basis, spans, linear independent, homogeneous linear equations, old basis and new basis, the general solution, basis row space, basis column space, orthonormal bases, gram Schmidt. ● Eigenvalue dan eigen vector, diagonalization, orthogonal diagonalization (using program). ● Case example in linear algebra.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments: 15% • Written Midterm assessment: 25% • Final oral exam: 30% Students must have a final grade of 55.6% or higher to pass.	
Reading List	● R. N. Zulfikar, Aljabar Linear. Tangguh Denara Jaya, 2023. ● S. Axler, Linear Algebra Done Right, 4th edition. Springer, 2024. ● R. K. George, A. Ajayakumar, A Course in Linear Algebra. Springer, 2024. ● L. Shen, Wang, Haohao, J. Wojdylo, Linear Algebra. Packt Publishing, 2024. ISBN: 9781683923763. [Online]. Available: https://portal.igpublish.com/iglibrary/obj/PACKT0007444?searchid=1754985770684VoYVpZQfRnr~Vhx8hW56k	