	Universitas Negeri Surabaya Faculty of Mathematics and Natural Sciences Undergraduate Mathematics Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Elementary Linear Algebra	4420103010		T=3	P=0	ECTS=4.77	2	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	Prof. Dr. Raden Sulaiman, M.Si.

Learning model	**Case Studies**
Program Learning Outcomes (PLO)	**PLO study program that is charged to the course**
	Program Objectives (PO)
	PLO-PO Matrix

	P.O

PO Matrix at the end of each learning stage (Sub-PO)

P.O	Week															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Short Course Description	Provides a foundation for understanding linear algebra. Some of the study materials that will be discussed in this course include: systems of linear equations (SPL), matrices and their operations, vector spaces and subspaces, bases and dimensions, row/column spaces, inner product spaces, linear transformations, eigenvalues and eigenvectors. In the SPL material, we will discuss how to solve the SPL, both by Gauss elimination and Gauss-Jordan elimination. A more specific discussion of matrix operations will discuss the determinant and inverse of the nxn matrix. The inner product space that will be discussed is the inner product space of Euclid and others. Apart from that, norms, orthogonality and the Gramm-Scmidth process are also discussed. The eigenvalues that will be discussed are real eigenvalues. Learning is carried out by activating students through questions and answers, training students to argue using presentation media.
References	**Main :**

1. Anton, H.& Rorres, C. 2005. Elementary Linear Algebra (ninth Edition) . John Wiley & Sons.
2. Andrilli, S.& Hecker, D. 2010. Elementary Linear Algebra (Fourth Edition) . Academic Press.
3. H. Ted Davis & Kendall T Thomson. 2000. Linear Algebra and Linear Operators in Engineering .

	Supporters:
Supporting lecturer	Prof. Dr. Raden Sulaiman, M.Si. Dwi Nur Yunianti, S.Si., M.Sc. Muhammad Jakfar, S.Si., M.Si. Nina Rinda Prihartiwi, S.Pd., M.Pd. Hasanuddin Al-Habib, M.Si.

Week-	Final abilities of each learning stage (Sub-PO)	Evaluation		Help Learning, Learning methods, Student Assignments, [Estimated time]		Learning materials [References]	Assessment Weight (%)
		Indicator	Criteria & Form	Offline (*offline*)	Online (*online*)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

1	1. Explain linear equations and systems of linear equations 2. Solve problems using SPL concepts	1. Defining equations 2. Defining linear equations 3. Defining a system of linear equations 4. Solving systems of linear equations (including SPLH)	**Form of Assessment** : Participatory Activities	Expository			2%
2	1. Explain linear equations and systems of linear equations 2. Solve problems using SPL concepts	1. Defining equations 2. Defining linear equations 3. Defining a system of linear equations 4. Solving systems of linear equations (including SPLH)	**Form of Assessment** : Participatory Activities	Expository			0%
3	1. Operate matrices using operation properties 2. Using matrix operations to determine the determinant and inverse of a matrix	1. State the definition of a matrix and matrix order 2. Operating the matrix 3. Using matrix properties 4. Determining the determinant of a matrix 5. Determining the inverse of a matrix		Expository			0%
4	1. Operate matrices using operation properties 2. Using matrix operations to determine the determinant and inverse of a matrix	1. State the definition of a matrix and matrix order 2. Operating the matrix 3. Using matrix properties 4. Determining the determinant of a matrix 5. Determining the inverse of a matrix		Expository			0%
5	1. Operate matrices using operation properties 2. Using matrix operations to determine the determinant and inverse of a matrix	1. State the definition of a matrix and matrix order 2. Operating the matrix 3. Using matrix properties 4. Determining the determinant of a matrix 5. Determining the inverse of a matrix	**Form of Assessment** : Participatory Activities	Expository			0%

6	Explain vector spaces and subspaces of a vector space	1. Give an example of a vector space 2. Identifying sets that are vector spaces and those that are not 3. Give an example of a subspace of a vector space	**Form of Assessment** : Participatory Activities	Expository			0%
7	Explain vector spaces and subspaces of a vector space	1. Give an example of a vector space 2. Identifying sets that are vector spaces and those that are not 3. Give an example of a subspace of a vector space	**Form of Assessment** : Participatory Activities	Expository			0%
8			**Form of Assessment** : Portfolio Assessment				0%
9	Able to specify spanning and independent linear of a set of vectors	1. Specifying a set of vectors is a span or not 2. Specifying Linear independent Set 3. Determining the base and dimensions of the vector space	**Form of Assessment** : Participatory Activities	Expository			0%
10	Able to specify spanning and independent linear of a set of vectors	1. Specifying a set of vectors is a span or not 2. Specifying Linear independent Set 3. Determining the base and dimensions of the vector space	**Form of Assessment** : Participatory Activities	Expository			0%
11	Able to explain row space and column space of a matrix	1. Define the row space of a matrix 2. Define the base and dimensions of a matrix‘s line space	**Form of Assessment** : Participatory Activities	Expository			0%

12	1. Able to explain inner product space 2. Able to implement the Gram-Scmidth process to determine a determinant orthonormal basis of a matrix	1. Give an example of inner product space 2. Identifying a set with an operation is inner product space or not 3. Determine the length of a vector 4. Determine the distance and angle between two vectors 5. Determine the orthonormal vectors 6. Determine the orthonormal base with the Gram-Scmidth process	**Form of Assessment** : Participatory Activities				0%
13	Able to explain the concept of linear transformation	1. Example linear transformation 2. Identify functions that are linear transformation or not 3. Define the Base and Dimension regions resulting from linear transformations 4. Determining Nullity	**Form of Assessment** : Participatory Activities	Expository			0%
14	Able to explain the concept of linear transformation	1. Example linear transformation 2. Identify functions that are linear transformation or not 3. Define the Base and Dimension regions resulting from linear transformations 4. Determining Nullity	**Form of Assessment** : Participatory Activities	Expository			0%
15	1. Able to explain eigen values and eigen vectors 2. Able to implement eigen value and eigen vector of a matrix to determine the base and dimensions of eigen space	1. Determining the eigenvalue and eigenvector of a matrix 2. Determine the base and dimensions of the eigenspace	**Form of Assessment** : Participatory Activities	Expository			0%
16							0%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	2%
		2%

Notes

1. **Learning Outcomes of Study Program Graduates (PLO - Study Program)** are the abilities possessed by each Study Program graduate which are the internalization of attitudes, mastery of knowledge and skills according to the level of their study program obtained through the learning process.
2. **The PLO imposed on courses** are several learning outcomes of study program graduates (CPL-Study Program) which are used for the formation/development of a course consisting of aspects of attitude, general skills, special skills and knowledge.
3. **Program Objectives (PO)** are abilities that are specifically described from the PLO assigned to a course, and are specific to the study material or learning materials for that course.
4. **Subject Sub-PO (Sub-PO)** is a capability that is specifically described from the PO that can be measured or observed and is the final ability that is planned at each learning stage, and is specific to the learning material of the course.
5. **Indicators for assessing** abilities in the process and student learning outcomes are specific and measurable statements that identify the abilities or performance of student learning outcomes accompanied by evidence.
6. **Assessment Criteria** are benchmarks used as a measure or measure of learning achievement in assessments based on predetermined indicators. Assessment criteria are guidelines for assessors so that assessments are consistent and unbiased. Criteria can be quantitative or qualitative.
7. **Forms of assessment:** test and non-test.
8. **Forms of learning:** Lecture, Response, Tutorial, Seminar or equivalent, Practicum, Studio Practice, Workshop Practice, Field Practice, Research, Community Service and/or other equivalent forms of learning.
9. **Learning Methods:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, and other equivalent methods.
10. **Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
11. **The assessment weight** is the percentage of assessment of each sub-PO achievement whose size is proportional to the level of difficulty of achieving that sub-PO, and the total is 100%.
12. TM=Face to face, PT=Structured assignments, BM=Independent study.