	Universitas Negeri Surabaya Faculty of Engineering , Information Technology Education Undergraduate Study Program	Document Code

SEMESTER LEARNING PLAN

Courses		CODE		Course Family		Credit Weight				SEMESTER	Compilation Date
Linear and Matrix Algebra		8320702002				T=2	P=0	ECTS=3.18		3	July 18, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	....	....	Drs. Bambang Sujatmiko, M.T.

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	Discusses the concept of linear algebra and choosing the right method to solve various linear algebra problems, systems of linear equations and matrices, determinants, vector spaces, inner product spaces, eigenvalues and eigenvectors, linear transformations and various linear algebra.

References	Main :
	1. Kolman, Bernard. 2004. Elementary Linear Algebra . New Jearsey: Prentice Hall 2. Anton, Howard. 2010. Elementary Linear Algebra. John Wiley & Sons, Inc 3. Kuttler.2012. Elementary Linear Algebra. The Sailor Foundation. 4. Matthews, K.R. 2013. Elementary Linear Algebra. University of Queensland.
	Supporters:

Supporting lecturer	Andi Iwan Nurhidayat, S.Kom., M.T.

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	Understand matrix concepts and be able to operate matrices	1. Explain the concept of a matrix 2. Explain the types of matrices 3. Be able to complete matrix operations 4. Explain the properties of matrix operations	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and 2 X 50 exercises			0%

2	Determining the inverse of a matrix	1. Explain the meaning of matrix inverse 2. Explain the properties of matrix inverse 3. Find the inverse of a matrix of order 2x2 4. Find the inverse of a matrix of order nxn with a cofactor matrix 5. Find the inverse of a matrix of order nxn with elementary row transformation (TBE)	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and 2 X 50 exercises			0%
3	Determining the inverse of a matrix	1. Explain the meaning of matrix inverse 2. Explain the properties of matrix inverse 3. Find the inverse of a matrix of order 2x2 4. Find the inverse of a matrix of order nxn with a cofactor matrix 5. Find the inverse of a matrix of order nxn with elementary row transformation (TBE)	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and 2 X 50 exercises			0%
4	Determining the determinant of a matrix	1. Explain the meaning of determinant 2. determine the value of the determinant of a matrix of order 2x2 3. determine the value of the determinant of a matrix of order 3x3 4. explain the properties of the determinant 5. determine the value of the determinant of a matrix of order nxn with a cofactor matrix 6. determine the value of the determinant of a matrix of order nxn with row transformation elementary (TBE)	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and 2 X 50 exercises			0%
5	Determining the determinant of a matrix	1. Explain the meaning of determinant 2. determine the value of the determinant of a matrix of order 2x2 3. determine the value of the determinant of a matrix of order 3x3 4. explain the properties of the determinant 5. determine the value of the determinant of a matrix of order nxn with a cofactor matrix 6. determine the value of the determinant of a matrix of order nxn with row transformation elementary (TBE)	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and 2 X 50 exercises			0%

6	Can determine the solution of SPL (System of Linear Equations)	1. Explain the meaning of SPL 2. Explain the types of SPL 3. Explain the types of SPL solutions 4. Determine the SPL solution with 2 equations and 2 variables 5. Determine the SPL solution with n equations and n variables using the matrix method 6. Determine the solution SPL with n equations and n variables using the Cramer method 7. Determine the solution of SPL with n equations and n variables using the TBE method	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and 2 X 50 exercises			0%
7			**Criteria:** Class Participation Value Attendance Value Assignment Value	2 X 50			0%
8	Can determine the solution to SPL using Matlab and can use SPL for everyday problems	1. Able to operate Matlab 2. Determine SPL solutions using Matlab 3. Solve SPL with everyday problem cases	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and practicum 2 X 50			0%
9	Understand vector concepts and be able to operate vectors	1. Explain the meaning of vector 2. Explain how to express vectors 3. Explain equivalent vectors, zero vectors and negative vectors 4. Complete vector operations - Addition of vectors - Subtraction of vectors - Multiplication of vectors with scalars 5. Explain the properties of vector operations 6. Explain norms vector	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation, 2 X 50 Assignment Practice			0%
10	Able to operate vectors	1. Explain the operation of multiplying vector dot product and cross product 2. Determine the angle between two vectors 3. Implement recursion in several cases	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, presentation, Presentation/Assignment 2 X 50			0%
11	Determining the general vector space from a set of vectors	1. Explaining real vector spaces 2. Explaining subspaces 3. Explaining linear combinations 4. Building/stretching 5. Linear independence 6. basis	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and 2 X 50 exercises			0%
12	Students can use PGS to change non-orthonormal bases into orthonormal bases	1. Explain orthogonal sets and orthonormal sets 2. Explain the Gram Schmidt process	**Criteria:** Class Participation Value Attendance Value Assignment Value	Model: Cooperative Method: Discussion, Presentation and 2 X 50 exercises			0%
13	Can determine Linear Transformation, Kernel and Range of a vector	1. Explain Linear transformation 2. Explain Kernel and range	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation/Assignment and practicum 2 X 50			0%
14	Can determine the eigenvalues and eigenvectors of a matrix	1. Explaining eigenvalues 2. Explaining eigenvectors 3. Determining eigenvalues and vectors	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation/Assignment and practicum 2 X 50			0%

| 15 | can operate vectors with MATLAB | 1. Able to operate Matlab 2. Determine SPL solutions using Matlab | **Criteria:** Class Participation Value Attendance Value Assignment Value | Approach: Scientific Model: Cooperative Method: Discussion, Presentation/Assignment and practicum 2 X 50 | | | 0% |
| 16 | | | | | | | 0% |

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
		0%

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** ability in the process and student learning outcomes are specific and measurable statements that identify the ability 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.