SEMESTER STUDY PLAN

APPLICATION OF LINEAR ALGEBRA 2

(ELECTIVE COURSE)

(Project Based Learning Method)

DEPARTMENT OF MATHEMATICS AND DATA SCIENCE

FACULTY OF MATHEMATICS AND NATURAL SCIENCES

UNIVERSITAS ANDALAS

2024

SEMESTER STUDY PLAN (SSP)
BACHELOR PROGRAM OF MATHEMATICS
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
UNIVERSITAS ANDALAS

Course Name	Course Code	URL *I-Learn*	Credits	Semester	Compilation Date
Application of Linear Algebra 2	MAT62212	https://sci.ilearn.unand.ac.id	3	4	May 2024

Person In Charge	Study Plan Creator	Head of Research Group	Head of Study Program
	Monika Rianti Helmi, M.Si	Nova Noliza Bakar, M.Si	Dr. Noverina Alfiany

Intended Learning Outcomes (ILO) and Performance Indicator (PI)		Intended Learning Outcomes
	ILO-3	An ability to identify, explain, and generalize simple mathematical PI-1: An ability to identify simple mathematical problems
	ILO-4	An ability to use concepts and fundamental techniques of mathematics in solving simple mathematical problems PI-1: An ability to choose appropriate basic mathematical concepts and techniques in solving simple mathematical problems PI-2: An ability to illustrate simple mathematical problems based on appropriate basic mathematical concepts and techniques PI-3: An ability to solve simple mathematical problems using appropriate basic mathematical concepts and techniques
	ILO-6	Have ability data literacy and technology and can apply them in solving simple mathematical problems or other relevant fields PI-1: An ability to identify the right data and technology to solve simple mathematical problems or other fields
	ILO-7	An ability to communicate effectively especially in the area of mathematics in with diverse communities PI-1: An ability to convey ideas or study results orally, especially in the field of mathematics PI-2: An ability to present ideas or study results in writing, especially in the field of mathematics

		PI-3: An ability to respond to feedback given
	ILO-8	An ability to work in a team PI-1: An ability to actively participate in a team with full responsibility PI-2: An ability to respond well to any feedback within the team PI-3: An ability to complete tasks according to the set schedule PI-4: An ability to adapt in a team
	Course Learning Outcomes	
	1	Students are able to identify real problems related to vector spaces, inner product spaces, values and eigenvectors, and linear transformations (ILO-3: PI-1, PI-2);
	2	Students are able to choose methods, data, data collection techniques, and basic techniques to solve problems related to vector spaces, inner product spaces, values and eigenvectors, and linear transformations (ILO-6: PI-1)
	3	Students are able to use the concepts of vector space, inner product space, value and eigenvector, and linear transformation to solve real problems (ILO-4: PI-1);
	4	Students are able to analyze and evaluate research results (ILO-6: PI-1)
	5	Students are able to communicate the results of their research orally and in writing according to scientific principles. (ILO-7 : PI-1, PI-2, PI-3);
	6	Students are able to work in teams (ILOP-8)
Brief Description	This course will provide and discuss several applications or applications of basic linear algebra theories, namely vector space, inner product space, eigenvalue and Eigen vector, and linear transformation. Some applications related to the above concepts are genetica, AHP problem, PAC problems, search engine problems, matrices Leslie problems and cryptography.	

<table>
<tr><td>Course Materials</td><td colspan="2">Applications of :
1. General vector space
2. Inner product space
3. Eigen value and eigen vector
4. Linear transformation</td></tr>
<tr><td>References</td><td colspan="2">Main:
1. H. Anton & C. Rorres (2014). Elementary Linear Algebra. 11th edition. Wiley, USA
https://www.pdfdrive.com/elementary-linear-algebra-applications-version-11th-edition-e40154216.html
Additional:
2. Related articles or publications</td></tr>
<tr><td>Learning Media</td><td>Software:
● LMS Unand (http://fmipa.ilearn.unand.ac.id/)
● Zoom meeting
● Whatsapp</td><td>Hardware:
● Computer/Laptop
● Smartphone</td></tr>
<tr><td>Team Teaching</td><td colspan="2">1. Monika Rianti Helmi, M.Si
2. Dr. Yanita
3. Dr. Noverina Alfiany</td></tr>
<tr><td>Assessment</td><td colspan="2">Proposal, Project and Presentations</td></tr>
<tr><td>Required courses</td><td colspan="2">-</td></tr>
<tr><td>Academic Norms</td><td colspan="2">https://akademik.unand.ac.id/images/2022-03-30%20Peraturan%20Rektor%20Nomor%207%20Tahun%202022%20Penyelenggaraan%20Pendidikan-khusus%20Bab%20II.pdf</td></tr>
</table>

Weekly Study Plan

Week/ Meet (1)	Course Outcomes (2)	Indicator (3)	Assessment (4)	Activities/Forms of Learning [Time estimated]					Subject, references (10)	Weight (11)
				Synchronous*		Asynchronous**		Media (9)		
				Face to face Offline (5)	Face to face Online (6)	Individual (7)	Collaboration (8)			
1-4	CLO-1 Students are able to identify real problems related to vector spaces, inner product spaces, values and eigenvectors, and linear transformations (ILO-3: PI-1, PI-2);	• Accuracy in identifying problems related to vector spaces, inner product spaces, eigenvalues and vectors, and linear transformation • Accuracy in formulating problems related to vector spaces, inner product spaces, eigenvalues and vectors, and linear transformations	Project progress 5%	Teaching and discussion: Explanation of study plan and explanation of tasks Review and discussion of identification of problems and constraints of design project tasks [$4 \times 3 \times 50$ minutes]		Students identify problems and seek information on observations of the surrounding environment about related problems related to vector spaces, inner product spaces, eigenvalues and vectors, and linear transformations [$4 \times 3 \times 60$ minutes]	Students discuss in a group about identifying problems in the surrounding environment related to vector spaces, inner product spaces, eigen values, eigen vectors, and linear transformations [$4 \times 3 \times 60$ minutes]	• PPT • I learn (LMS Unand) (Specific condition: Zoom meeting, WA group, learning video)	• Study plan and contract • Problem Identification • Identify the need for proposed solutions to problems [1] and [2]	5%
5-7	CLO-2	Accuracy in choosing methods,	Project progress	Students collect data,		Students discuss in teams		• PPT	Review of vector spaces,	5%

	Students are able to choose methods, data, data collection techniques, and basic techniques to solve problems related to vector spaces, inner product spaces, values and eigenvectors, and linear transformations (ILO-6: PI-1)	data, data collection techniques, data presentation techniques, and basic techniques for solving problems related to vector spaces, inner product spaces, eigenvalues and vectors, and linear transformation	5%	present data, and determine basic techniques to solve problems related to vector spaces, inner product yield spaces, eigenvalues and vectors, and linear formation Time allocation [3 x 3 x 50 minutes]		to determine problems and propose solutions Time allocation 3 x 3 x 120 minutes]		• I learn • (Kondisi tertentu: Zoom meeting, WA group, video pembelajaran)	inner product spaces, eigenvalues, and vectors, and linear formations References [1] and [2]	
8	CLO-1 Students are able to identify real problems related to vector spaces, inner product spaces, values and eigenvectors, and linear transformations (ILO-3: PI-1, PI-2);	• Accuracy in identifying problems related to vector spaces, inner product spaces, eigenvalues and vectors, and linear transformation • Accuracy in formulating problems related to vector spaces, inner product	Research proposal report 5%	Students present research proposals, students discuss in groups, and provide suggestions and comments to the group that presents their research proposals		- Students look for references and learn about the course material - Students do the assigned assignments Time allocation [1 x 3 x 60 minutes]	Students discuss in groups and ask for references for research proposal improvements based on suggestions and input from other groups Time allocation [1 x 3 x 60 minutes]	• PPT • I learn	- Research Proposal Report - Presentation of progress reports (Introduction and Data) References [1] and [2]	5%

		spaces, eigenvalues and vectors, and linear transformations		Time allocation [1 x 3 x 50 minutes]						
	CLO-2 Students are able to choose methods, data, data collection techniques, and basic techniques to solve problems related to vector spaces, inner product spaces, values and eigenvectors, and linear transformations (ILO-6: PI-1)	• Accuracy in choosing methods, data, data collection techniques, data presentation techniques, and basic techniques for solving problems related to vector spaces, inner product spaces, eigenvalues and vectors, and linear transformation	Research proposal and presentations 5%							5%
	CLO-5 Students are able to communicate the results of their research orally and in writing according to scientific principles. (ILO-7 : PI-1, PI-2, PI-3)	Accuracy in communicating the result analysis orally (presentation) and in the form of scientific articles	Research proposal and presentation 5%							5%
9-10	CLO-3	Accuracy in using related theoretical	Research report	Review and discussion of		Students find references and	-Students discuss in	Ilearn	concepts of vector spaces,	10%

	Students are able to use the concepts of vector space, inner product space, value and eigenvector, and linear transformation to solve real problems (ILO-4: PI-1);	concepts related to vector spaces, inner product spaces, eigenvalues, and vectors, as well as linear formation accuracy in interpreting calculation results using concepts related to vector spaces, inner product spaces, eigenvalues and vectors, and linear formations	10%	the use of concepts related to vector spaces, inner product spaces, values and eigenvectors, and linear formations to solve real problems [2 x 3 x 50 minutes]		learn about the concepts related to the topic of the project Time allocation [2 x 3 x 60 minutes]	groups about using the concepts of vector spaces, inner product spaces, values and eigenvectors, and linear formations to solve real problems Time allocation [2 x 3 x 60 minutes]		inner product spaces, values and eigenvectors, and linear formations to solve real problems	
11-12	CLO-4 Students are able to analyze and evaluate research results (ILO-6: PI-1)	Accuracy in analyzing and evaluating design results	Progress report 10%	Discussion of analysis and evaluation of the final results of the study [2 x 3 x 50 minutes]		Students conduct research final results evaluation activities based on the results of team discussions [2 x 3 x 60 minutes]	Students work in teams to evaluate research results [2 x 3 x 60 minutes]	Ilearn	Stages and Review of the final results of the study	10%
	CLO-6 Students are able to work in teams (ILO-8)	The ability of students to work in teams	Progress report 5%							5%
13-15	CPLO-5 Students are able to communicate the results of their research orally and in writing according to	Accuracy in communicating the result analysis orally (presentation) and in the form of scientific articles	Research report 10%	Kuliah dan diskusi - Penjelasan materi kuliah - penjelasan tugas		Presentation project Time allocation [3 x 3 x 60 minutes]	Students refine reports based on feedback Time allocation [3 x 3 x 60 minutes]	Ilearn, zoom	Presentation project	10%

	scientific principles. (ILO-7 : PI-1, PI-2, PI-3)			[3 × 3 × 50 menit]						
	CLO-6 Students are able to work in teams (ILO-8)	The ability of students to work in teams	Research report and presentation 10%							10%
16	CLO-3 Students are able to use the concepts of vector space, inner product space, value and eigenvector, and linear transformation to solve real problems (ILO-4: PI-1);	Accuracy in using theoretical concepts related to vector spaces, inner product spaces, eigenvalues, and vectors, and linear transformation Accuracy in interpreting calculation results using concepts related to vector spaces, inner product spaces, eigenvalues and vectors, and linear formations	Final report 10%	Project Presentation Time allocation [1 x 3 x 50 minutes]		Students refine reports based on feedback Time allocation [1 x 3 x 60 minutes]	Students discuss the project report improvements based on feedback Time allocation [1 x 3 x 60 minutes]	Ilearn	Project Report Poster Article	10%
	CLO-4 Students are able to analyze and evaluate research results (ILO-6: PI-1)	Accuracy in analyzing and evaluating design results	Final report 5%							5%

	CLO-5 Students are able to communicate the results of their research orally and in writing according to scientific principles. (ILO-7 : PI-1, PI-2, PI-3)	Accuracy in communicating analysis results orally (presentation) and in the form of scientific articles	Final report 5%							5%
	CLO-6 Students are able to analyze and evaluate research results (ILO-6: PI-1)	The ability of students to work in teams	Final report 5%							5%

1 credit = 50 minutes face-to-face meeting, 60 minutes structured study, 60 minutes independent study
Each meeting duration is 3 credits = 3×50 minutes

Indicators, Criteria, and Assessment Weights

1. Assessment weight for each Assessment

NO	Assessment	Weight (%)
1	Proposal (progress and report)	20
2	Presentation	20
3	Project (progress, report, article and poster)	60
TOTAL		**100**

2. Assessment weight for Intended Learning Outcome
   - CLO-1: 10 %
   - CLO-2: 10 %
   - CLO-3: 20 %
   - CLO- 4: 20 %
   - CLO-5: 20 %
   - CLO-6: 20%

Assessment Plan Table:

No.	CLO	Assessment			Weight (%)
		Proposal (progress and report)	Project (progress, report, article and poster)	Presentation	
1	Students are able to identify real problems related to vector spaces, inner yield spaces, values and eigenvectors, and linear formations (ILO-3: PI-1, PI-2)	10%			10%
2	Students are able to choose methods, data, data collection techniques, and basic techniques to solve problems related to vector spaces, deep yield spaces, values and eigenvectors, and linear formations (ILO-6: PI-1)	10%			10%
3	Students are able to use the concepts of vector space, inner product space, value and eigenvector, and linear transformation to solve real problems (ILO-4: PI-1)		20%		20%
4	Students are able to analyze and evaluate research results (ILO-6: PI-1)		20%		20%
5	Students are able to communicate the results of their research orally and in writing according to scientific principles. (ILO-7 : PI-1, PI-2, PI-3);		15%	10%	20%
6	Students are able to work in teams (ILO-8)	5%	5%	10%	20%
	Total	5%	60%	20%	**100 %**

Information:
TK: Group ask

Matrix of CLO and ILO

CLO	ILO																															
	1			**2**			**3**			**4**			**5**				**6**					**7**			**8**				**9**			
	PI			**PI**			**PI**			**PI**			**PI**				**PI**					**PI**			**PI**				**PI**			
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	4	1	2	3	4	5	1	2	3	1	2	3	4	1	2	3	4
1							✓	✓																								
2																	✓															
3										✓																						
4																	✓															
5																						✓	✓	✓								
6																									✓	✓	✓	✓				