

SEMESTER STUDY PLAN
INTRODUCTION TO MODULE THEORY
(ELECTIVE COURSE)



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>I-Learn</i>	Credits	Semester	Compilation Date	
		Introduction to Module Theory		MAT62215	https://sci.ilearn.unand.ac.id	3	6	10 May 2024	
Person In Charge		Study Plan Creator			Head of Research Group		Head of Study Program		
		Nova Noliza Bakar, 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-2: An ability to explain simple mathematical problems PI-3: An ability to generalize simple mathematical problems						
		ILO-5	An ability formally and correctly proves a simple mathematical statements using facts and methods that have been studied PI-1: An ability to identify the formal structures and analogous forms in mathematics PI-2: An ability to use facts and apply methods to prove simple mathematical statements PI-3: An ability to present simple mathematical statement proof rigorously (sequentially and conscientious)						
		ILO-9	An ability to apply knowledge of mathematics in career and involve in lifelong learning PI-1: An ability to carry out learning independently to deepen and expand the knowledge that has been obtained PI-2: An ability to carry out literature studies						
		Course Learning Outcomes							

	1	An ability to explain the meaning of ring modules, submodules and factor modules. (ILO-3: PI-2, PI-3, ILO-5: PI-1, PI-2 PI-3 ILO-9: PI-1, PI-2)	
	2	An ability to explain the meaning of module homomorphism and module isomorphism. (ILO-3: PI-2, PI-3, ILO-5: PI-1, PI-2 PI-3 ILO-9: PI-1, PI-2)	
	3	An ability to explain the meaning of free module, annihilator, and torque module. (ILO-3: PI-2, PI-3, ILO-5: PI-1, PI-2 PI-3 ILO-9: PI-1, PI-2)	
	4	An ability to explain the meaning of projective modules. (ILO-3: PI-2, PI-3; ILO-5: PI-1, PI-2 PI-3 ILO-9: PI-1, PI-2)	
Brief Description	In this course, mathematical concepts will be discussed in the form of definitions and mathematical properties in the form of lemmas and theorems related to Modules, which include: ring modules, submodules, direct added products, factor modules, module homomorphisms, types of module homomorphisms, bases and free modules, annihilator and torque modules, exact series, projective modules, and ideal invertible.		
Course Materials	1. Module 2. Module homomorphism 3. Free modules 4. Projective module		
References	Main:		
	1. Blyth, T. S., Module Theory: An Approach to Linear Algebra, Electronic Edition, St Andrews-USA, 2018		
	Additional:		
	2. Adkins,W. A., and Weintraub, Algebra an Approach via module Theory, Springer-Verlag. 1992		
Learning Media	Software:		Hardware:
	• LMS Unand (http://fmipa.ilearn.unand.ac.id/) • Zoom meeting • Whatsapp		• Computer/Laptop • Smartphone
Team Teaching	Nova Noliza Bakar, M.Si		

Assessment	Homework, Quizzes, Mid-Term exam, Final exam
Required courses	MAT62112 Algebraic Structures MAT62121 Elementary Linear Algebra
Academic Norms	https://akademik.unand.ac.id/images/2022-03-30%20Peraturan%20Rektor%20Nomor%207%20Tahun%202022%20Penyelenggaraan%20Pendidikan-khusus%20Bab%20II.pdf

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	Able to understand lecture rules • Be able to mention the topics that will be studied in this course • Be able to give an example of a commutative group • Be able to give an example of a	• Discipline in implementing the college contract • Accuracy in describing commutative groups • Accuracy in explaining commutative rings	• Activeness	• Lectures and discussions: - introduction of SSP - task explanation - explanation of the assessment - Review of commutative groups - Review of commutative ring [1x3x50 minutes]				• Whiteboard • WA group	• Tuition Contract • SSP • Commutative groups • Commutative ring	

	commutative ring									
2	• Be able to give an example of a vector space. • Able to determine the basis of a vector space. • Be able to give an example of a linear transformation.	• Accuracy in providing examples of a vector space. • Accuracy in determining the basis of a vector space. • Accuracy in giving an example of a linear transformation.	• Activities	• Lectures and discussions: - Review of vector spaces - Review of base - Review of linear transformations [1x3x50 minutes]				• Whiteboard • WA group	• Vector spaces • Base • Linear transformation	
3	CLO-1 Able to explain the meaning of ring modules, submodules and factor modules	• Accuracy in stating the definitions of left module, right module, module. • Accuracy proves the properties related to the module.	• Activities	• Lectures and discussions about left modules, right modules, and modules, as well as properties related to modules. [1x3x50 minutes]				• Whiteboard • WA group	• Left module • Right module • Module	10%

4	CLO-1 Able to explain the meaning of ring modules, submodules and factor modules	• Accuracy in stating the definition of submodule. • Accuracy in providing examples of submodules built by a set. • Accuracy in proving properties related to submodules.	• Activities	• Lectures and discussions about submodules and submodules built by a set [1x3x50 minutes]				• Whiteboard • WA group	• Submodules • Submodules built by a set	10%
5	CLO-1 Able to explain the meaning of ring modules, submodules and factor modules	• Accuracy in explaining the concept of direct quantities in submodules. • Accuracy in explaining the factor module concept. • Honesty in taking quizzes • Accuracy in answering assignment questions • Originality of task results	• Activeness • Quiz 1 • Task 1	• Quiz on modules and submodules [1x1x50 minutes] • Lectures and discussions about direct quantities in the module, and about the factor module [1x2x0 minutes] • AM Students do assignments on direct sums and factor modules.				• Whiteboard • WA group	• Direct sum • Factor module	10%

				[1x3x60 minutes]						
6	CLO-2 Be able to explain the meaning of module homomorphism and module isomorphism.	• Accuracy in stating the definition of module homomorphism. • Accuracy in proving properties related to module homomorphism. • Accuracy in proving properties related to module homomorphism.	• Activeness	• Lectures and discussions on the concepts of linear transformations, standard matrices, and related properties. [1x3x50 minutes]				• Whiteboard • WA group	• Definition and examples of module homomorphism • Properties related to module	15%
7	CLO-2 Be able to explain the meaning of module homomorphism and module isomorphism.	• Accuracy in stating the definitions of monomorphism, epimorphism, and module isomorphism. • Accuracy in proving properties related to module isomorphism. • Accuracy in answering assignment questions • Originality of task results	• Activeness • Task 2	• Lecture and discussion on types of homomorphism and several properties related to module isomorphism [1x3x50 minutes] • AM Students do assignments on direct sums and factor modules [1x3x60 minutes]				• Whiteboard • WA group	• Module monomorphism • Module epimorphism • Module isomorphism	10%

8	MID-TERM EXAM									
9	CLO-3 Able to explain the meaning of free module, annihilator, and torque module	• Accuracy in determining the basis for a module • Accuracy in stating the definition of free modules and giving examples	• Activeness	• Lectures and discussions about free base and modules [1x3x50 minutes]				• Whiteboard • WA group	• Base • Free modules	10%
10	CLO-3 Able to explain the meaning of free module, annihilator, and torque module	• Accuracy in determining the zero on the module • Accuracy in providing annihilator examples in the module	• Activeness	• Lecture and discussion about annihilator in the module [1x3x50 minutes]				• Whiteboard • WA group	• Annihilator	7,5%
11	CLO-3 Able to explain the meaning of free module, annihilator, and torque module	• Accuracy in determining torque elements • Accuracy in proving the properties related to the torque module • Honesty in taking quizzes	• Activeness • Quiz 2	• Quiz on bases, independent modules and annihilator. [1x1x50 minutes] • Lecture and discussion on torque modules and the properties associated with them. [1x2x50 minutes]				• Whiteboard • WA group	• Modul torsi	7,5%

12	CLO-4 Able to explain the meaning of projective module	• Accuracy in stating the definition of an exact sequence, short exact sequence and giving examples • Accuracy in proving properties related to short exact sequences.	• Activeness	• Lectures and discussions about sequences, short sequences, and properties related to short exact sequences. [1x3x50 minutes]				• Whiteboard • WA group	• Exact sequence	5%
13	CLO-4 Able to explain the meaning of projective module	• Accuracy in stating the definition of a separate exact sequence, and giving examples • Accuracy in proving properties associated with separate exact sequences.		• Lecture and discussion on the definition and examples of discrete exact sequences [1x3x50 minutes]				• Whiteboard • WA group	• Exact sequence	5%
14	CLO-4 Able to explain the meaning of projective module	• Accuracy in stating the definition of the projective module. • Accuracy in proving the properties related to the projective module.	• Activeness • Task 3	• Lecture and discussion on the definition and examples of projective modules, as well as related properties [1x3x50 minutes]		-		• Whiteboard • WA group	• Projective module	7,5%

		• Accuracy in answering assignment questions • Originality of task results		• AM Students do assignments on exact sequences and projective modules						
				[1x3x60 minutes]						
15	CLO-4 Able to explain the meaning of projective module	• Accuracy in stating the definition of ideal invertible. • Accuracy in proving the properties related to ideal invertibility.	• Activeness	• Lectures and discussions about the ideal invertible				• Whiteboard • WA group	• Invertible are idea	7,5%
				[1x3x50 minutes]						
Total Weight										100%
16	FINAL EXAM									

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	Mid-Term Exam	30
2	Final Exam	30

3	Task	20
4	Quizzes	20
TOTAL		100

2. Assessment weight for Intended Learning Outcome

- CLO-1: 30 %
- CLO-2: 20 %
- CLO-3: 25 %
- CLO-4: 25 %

Assessment Plan Table:

No.	CLO	Assessment				Weight (%)
		Task (%)	Quizzes (%)	Mid-Term Exam (%)	Final Exam (%)	
1	An ability to explain the meaning of ring modules, submodules and factor modules. (ILO-3: PI-2, PI-3; ILO-5: PI-1, PI-2 PI-3; ILO-9: PI-1, PI-2)	5	10	15	-	30
2	An ability to explain the meaning of module homomorphism and module isomorphism. (ILO-3: PI-2, PI-3; ILO-5: PI-1, PI-2 PI-3; ILO-9: PI-1, PI-2)	5	-	15	-	20
3	An ability to explain the meaning of free module, annihilator, and torque module. (ILO-3: PI-2, PI-3; ILO-5: PI-1, PI-2 PI-3; ILO-9: PI-1, PI-2)	-	10	-	15	25
4	An ability to explain the meaning of projective modules. (ILO-3: PI-2, PI-3; ILO-5: PI-1, PI-2 PI-3 ILO-9: PI-1, PI-2)	10	-	-	15	25
Total		20	20	30	30	100

Matrix of CLO and ILO

[illegible]

