SEMESTER STUDY PLAN

INTRODUCTION TO MEASURE THEORY AND LEBESGUE INTEGRAL

(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-Learn*	Credits	Semester	Compilation Date
Introduction to Measure Theory and Lebesgue Integral	MAT62222	https://sci.ilearn.unand.ac.id	3	6	11 May 2024

Person In Charge	Study Plan Creator	Head of Research Group	Head of Study Program
	Dr. Shelvi Ekariani	Dr. Haripamyu	Dr. Noverina Alfiany

	Intended Learning Outcomes	
Intended Learning Outcomes (ILO) and Performance Indicator (PI)	**ILO-2**	Possesses profound knowledge of the basic concept mathematics PI-1: An ability to explain basic mathematical concepts PI-2: An ability to provide examples that are relevant to basic mathematical concepts PI-3: An ability to determine solutions to simple problems using basic mathematical concepts
	ILO-3	An ability to identify, explain and generalize simple mathematical PI-1: An ability to identify simple mathematical problems PI-2: An ability to explain simple mathematical problems PI-3: An ability to generalize simple mathematical problems
	ILO-4	An ability to use concept and fundamental technique 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-5	An ability to 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) PI-4: An ability to conclude or interpret result of the proving simple mathematical statement
	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
	Course Learning Outcomes	
	1	An ability to mastery the basic concepts of measure and Lebesgue integral, as well as their related properties. (**ILO-2**: PI-1, PI-2, PI-3)
	2	An ability to apply the basic properties learned to solve problems related to the course material. (**ILO-4**: PI-1, PI-2, PI-3)
	3	An ability to generalize problems related to the subject matter of this course. (**ILO-3**: PI-1, PI-2, PI-3)
	4	An ability to identify the formal structure of statements related to the course material and their analogous forms. (**ILO-5**: PI-1-4)
	5	An ability to mastery of fundamental techniques necessary for problem-solving within the scope of this course material. (**ILO-4**: PI-1, PI-2, PI-3)
	6	An ability to independently solve problems related to the theory of measure and Lebesgue integral. (**ILO-9**: PI-1)

Brief Description	This course provides experience for students to know about sigma algebras, measures, outer measures, measurable spaces, measure spaces, measurable sets and functions, simple functions, Lebesgue integral, and L^p spaces.	
Course Materials	Sigma Algebra, Measurable Space, Measure, Measure Space, Outer Measure, Measurable Set, Measurable Function, Simple Function, Equivalence Relation, Lebesgue Integral, L^p Space.	
References	**Main:** 1. D. L. Cohn. (2013). *Measure Theory*. 2nd edition. Springer, New York **Additional:** 2. J. K. Hunter. (2011). *Measure Theory*. Lectures Note	
Learning Media	**Software:**	**Hardware:**
	• LMS Unand (http://fmipa.ilearn.unand.ac.id/) • Zoom meeting • Whatsapp	• Computer/Laptop • Smartphone
Team Teaching	Dr. Shelvi Ekariani	
Assessment	Homework, Quizzes, Mid-Term exam, Final exam	
Required courses	Real Analysis 1	
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	CLO-1 An ability to mastery the basic concepts of measure and Lebesgue integral, as well as their related properties. (**ILO-2**: PI-1, PI-2, PI-3)	• Discipline in carrying out the course contract. • Accuracy in understanding related material.	Non test Test Mid-Term exam: 10% Quizzes 1: 3%	Teaching and discussion: - Explanation of Semester Learning Plan - explanation of learning material - explanation of the task - explanation of the assessment [1 × 3 × 50 minutes]	Teaching and discussion: - Explanation of Semester Learning Plan - explanation of learning material - explanation of the task - explanation of the assessment [1 × 3 × 50 minutes] (Specific conditions: The total number of blended learning	Students read and study learning materials related to real number systems and their properties [1 × 3 × 120 minutes]		• PPT • I learn (LMS Unand) • (Specific condition: Zoom meeting, WA group, learning video)	• Course Introduction • Description course References: Main Reference 1.	13%

					meetings is 40% of the total number of meetings)					
2	CLO-3 An ability to generalize problems related to the subject matter of this course. (**ILO-3**: PI-1, PI-2, PI-3)	• Accuracy in understanding related material • Accuracy in answering assignment questions • Neatness in completing assignments • Originality of assignment results	Non test Test Mid-Term exam: 3% Quizzes 1: 3%	Lectures and discussions [1 × 3 × 50 minutes]		Students read and study materials from the main reference and others. [1 × 3 × 120 minutes]		• PPT • I learn (LMS Unand) • (Specific condition: Zoom meeting, WA group, learning video)	• Definition of Sigma Algebra • Examples of Sigma Algebras Reference: Main Reference 1.	3%
3	CLO-2 An ability to apply the basic properties learned to solve problems related to the course material. (**ILO-4**: PI-1, PI-2, PI-3)	• Accuracy in understanding related material • Accuracy in answering assignment questions	Non test: Homework 1: 3% Test Mid-Term exam: 5%	Lectures and discussions [1 × 3 × 50 minutes]		Students read and study materials from the main reference and others. [1 × 3 × 120 minutes]		• PPT • I learn (LMS Unand) • (Specific condition: Zoom meeting,	• Definition of Measurable Space • Examples of Measurable Spaces	8%

		• Neatness in completing assignments • Originality of assignment results						WA group, learning video)	Reference: Main Reference 1.	
4-5	CLO-1 An ability to mastery the basic concepts of measure and Lebesgue integral, as well as their related properties. (**ILO-2**: PI-1, PI-2, PI-3) CLO-6 An ability to independently solve problems related to the theory of measure and Lebesgue integral. (**ILO-9**: PI-1)	• Accuracy in understanding related material • Accuracy in answering assignment questions • Neatness in completing assignments • Originality of assignment results	Non test : - Test: Mid-Term exam: 10% Quizzes 1: 2%	Lectures and discussions [1 × 3 × 50 minutes]		Students read and study materials from the main reference and others [1 × 3 × 120 minutes]		• PPT • I learn (LMS Unand) • (Specific condition: Zoom meeting, WA group, learning video	• Definition of Measure • Examples of Measures • Definition of Measure Space • Examples of Measure Spaces Reference: Main Reference 1.	12%
6-7	CLO-2 An ability to apply the basic properties learned to solve	• Accuracy in understanding related material	Non test: Homework 1: 2%	Lectures and discussions		Students read and study materials from the main		• PPT • I learn (LMS Unand)	• Definition of Outer Measure	11%

	problems related to the course material. (**ILO-4**: PI-1, PI-2, PI-3) CLO-3 An ability to generalize problems related to the subject matter of this course. (**ILO-3**: PI-1, PI-2, PI-3)	• Accuracy in answering assignment questions • Neatness in completing assignments • Originality of assignment results	Test Mid-Term exam: 7% Quizzes 1: 2%	[1 × 3 × 50 minutes]		reference and others [1 × 3 × 120 minutes]		• (Specific condition: Zoom meeting, WA group, learning video)	• Examples of Outer Measures • Definition of Measurable Set • Examples of Measurable Sets Reference: Main Reference 1.	
8	**MID-TERM EXAM**									
9-10	CLO-3 An ability to generalize problems related to the subject matter of this course. (**ILO-3**: PI-1, PI-2, PI-3) CLO-4 An ability to identify the formal structure of statements related to the course material	• Accuracy in understanding related material • Accuracy in answering assignment questions • Neatness in completing assignments • Originality of assignment results	Non test : Test Final exam: 12% Quizzes 2: 1%	Lectures and discussions [2 × 3 × 50 minutes]		Students read and study materials from the main reference and others [2 × 3 × 120 minutes]		• PPT • I learn (LMS Unand) • (Specific condition: Zoom meeting, WA group, learning video)	• Definition of Measurable Function • Examples of Measurable Functions • Definition of Characteristic Function • Properties of	**13%**

	and their analogous forms. (**ILO-5**: PI-1-4)								Characteristic Functions Reference: Main Reference 1.	
11-13	CLO-4 An ability to identify the formal structure of statements related to the course material and their analogous forms. (**ILO-5**: PI-1-4) CLO-5 An ability to mastery of fundamental techniques necessary for problem-solving within the scope of this course material. (**ILO-4**: PI-1, PI-2, PI-3) CLO-6 Ability to independently solve problems related to the theory of	• Accuracy in understanding related material • Accuracy in answering assignment questions • Neatness in completing assignments • Originality of assignment results	Non test: Homework 2: 5% Test Final exam: 15% Quizzes 2: 7%	Lectures and discussions [2 × 3 × 50 minutes]		Students read and study materials from the main reference and others [2 × 3 × 120 minutes]		• PPT • I learn (LMS Unand) • (Specific condition: Zoom meeting, WA group, learning video)	• Definition of Simple Function • Canonical Representation • Examples of Simpe Functions • Equivalence Relation • Equivalence Class • Examples of Equivalence Relations and Equivalence Classes	**27%**

	measure and Lebesgue integral. (**ILO-9**: PI-1)									
14-15	CLO-2 Ability to apply the basic properties learned to solve problems related to the course material. (**ILO-4**: PI-1, PI-2, PI-3) CLO-4 Ability to identifying the formal structure of statements related to the course material and their analogous forms. (**ILO-5**: PI-1-4) CLO-6 Ability to independently solve problems related to the theory of measure and Lebesgue	• Accuracy in understanding related material • Accuracy in answering assignment questions • Neatness in completing assignments • Originality of assignment results	Non test: Test Final exam: 8% Quizzes 2: 2%	Lectures and discussions [2 × 3 × 50 minutes]		Students read and study materials from the main reference and others [2 × 3 × 120 minutes]		• PPT • I learn (LMS Unand) • (Specific condition: Zoom meeting, WA group, learning video)	• Lebesgue Integral • Examples of Lebesgue Integrable Functions • L^p Space • Properties of L^p Spaces	**10%**

	integral. (**ILO-9**: PI-1)									
									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	35
2	Final Exam	35
3	Homework	10
4	Quizzes	20
TOTAL		**100**

2. Assessment weight for Intended Learning Outcome

- CLO-1: 20 %
- CLO-2: 20 %
- CLO-3: 20 %
- CLO-4: 10 %
- CLO-5: 20 %
- CLO-6: 10%

Assessment Plan Table:

No.	CLO	Assessment				Weight (%)
		Homework (%)	Quizzes (%)	Mid-Term Exam (%)	Final Exam (%)	
1	An ability to mastery the basic concepts of measure and Lebesgue integral, as well as their related properties. (**ILO-2**: PI-1, PI-2, PI-3)		Quizzes 1: 5	15		20
2	An ability to apply the basic properties learned to solve problems related to the course material. (**ILO-4**: PI-1, PI-2, PI-3)	Homework 1: 5		10	5	20
3	An ability to generalize problems related to the subject matter of this course. (**ILO-3**: PI-1, PI-2, PI-3)		Quizzes 1: 5	5	10	20

4	An ability to identify the formal structure of statements related to the course material and their analogous forms. (**ILO-5**: PI-1-4)		Quizzes 2: 5		5	10
5	An ability to mastery of fundamental techniques necessary for problem-solving within the scope of this course material. (**ILO-4**: PI-1, PI-2, PI-3)	Homework 2: 5	Quizzes 2: 5		10	20
6	An ability to independently solve problems related to the theory of measure and Lebesgue integral. (**ILO-9**: PI-1)			5	5	10
	Total	**10**	**20**	**35**	**35**	**100**

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																													□			