



Module Description/Course Syllabi

Study Programme: Mathematics (Master Degree)
Faculty of Mathematics and Natural Sciences
Universitas Andalas

1. Course number and name
MAT81121 Advanced Real Analysis
2. Credits and contact hours/Number of ECTS credits allocated
3 sks /4,53 ECTS
3. Instructors and course coordinator
1. Dr. Haripamyu, 2. Dr. Shelvi Ekariani
4. Text book, title, author, and year
Robert R. Strichartz, <i>The Way of Analysis</i> , rev. ed., Jones and Bartlett Learning, 2000
5. Recommended reading and other learning resources/tools
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6. Specific course information
A. Brief description of the content of the course (catalog description)
This course begins by discussing how to construct a real number system through knowledge of the rational number system. Next, study the functions of one real-valued function related to continuity, derivatives, and integrals and sequences of functions.
B. Prerequisites or corequisites
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C. Indicate whether a required or elective course in the program
Required
D. Level of course unit (according to EQF: first cycle Bachelor, second cycle Master)
Second Cycle Master
E. Year of study when the course unit is delivered (if applicable)
1st year
F. Semester when the course unit is delivered
Odd semester/even semester
G. Mode of delivery (face-to-face, distance learning)
Face to face
7. Intended Learning Outcomes

<p>ILO-2: Mastering mathematical concepts and applications (real analysis, advanced linear algebra, and statistics) in solving complex mathematical problems. PI-1 : Able to explain mathematical concepts (Real Analysis, Advanced Linear Algebra, and Statistics). PI-2 : Able to identify complex mathematical problems. PI-3 : Able to solve complex mathematical problems.</p> <p>ILO-3: Comprehensive mastery of one or several theories for development in the fields of analysis, algebra, applied mathematics, statistics, and combinatorial mathematics. PI-1 : Able to identify theories used in related mathematical problems. PI-2 : Able to apply theories for advancement in related fields (advanced theory). PI-3 : Able to use advanced theory to solve related mathematical problems.</p>
<p>8. <i>Course Learning Outcomes</i></p>
<ol style="list-style-type: none"> 1. Students will be able to explain the concept of the rational number system, its definition, and their properties. 2. Students will be able to use the concept of the rational number system in constructing the real number system and its properties 3. Students will be able to generalize the concepts and properties of sets in real numbers. 4. Students are able to explain the concept of continuity of a function and identify the properties of continuity for a real-valued function. 5. Students are able to explain the concept of differential and integral calculus, identify the properties of derivatives and integral , and their relation to continuity. 6. Students can reason intuitively and analytically and can express the results of their reasoning in writing, systematically and rigorously.
<p>9. <i>Brief list of topics to be covered</i></p>
<p>Real number system, Continuous functions, Differential calculus, Integral calculus</p>
<p>10. <i>Learning and teaching methods</i></p>
<p>Small group discussion, Directed learning</p>
<p>11. <i>Language of instruction</i></p>
<p>Bahasa Indonesia</p>
<p>12. <i>Assessment methods and criteria</i></p>
<p>Summative Assessment:</p> <ol style="list-style-type: none"> 1. Tasks: 20% 2. Quiz: 20 % 3. Mid Semester: 30% 4. Final Semester: 30% <p>Formative Assessment:</p>

**SEMESTER STUDY PLAN
ADVANCED REAL ANALYSIS
(COMPULSORY COURSE)**



**DEPARTMENT OF MATHEMATICS AND DATA SCIENCE
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
UNIVERSITAS ANDALAS**

2024



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

Course Name		Course Code	URL I-Learn	Credits	Semester	Compilation Date
Advanced Real Analysis		MAT81121	https://sci.ilearn.unand.ac.id	3	1	12 May 2024
Person In Charge		Study Plan Creator		Head of Research Group	Head of Study Program	
		Dr. Haripamyu Dr. Shelvi Ekariani		Dr. Haripamyu	Dr. Noverina Alfiany	
Intended Learning Outcomes (ILO) and Performance Indicator (PI)		Intended Learning Outcomes				
		ILO-2	Mastering mathematical concepts and applications (real analysis, advanced linear algebra, and statistics) in solving complex mathematical problems. PI-1: Able to explain mathematical concepts (Real Analysis, Advanced Linear Algebra, and Statistics) PI-2: Able to identify complex mathematical problems PI-3: Able to solve complex mathematical problems			
		ILO-3	Comprehensive mastery of one or several theories for development in the fields of analysis, algebra, applied mathematics, statistics, and combinatorial mathematics. PI-1: Able to identify theories used in related mathematical problems. PI-2: Able to apply theories for advancement in related fields (advanced theory). PI-3: Able to use advanced theory to solve related mathematical problems			
		Course Learning Outcomes				
		1	Ability to explain the concept of the rational number system, its definition, and their properties (ILO-2: PI-1, PI-2, PI-3, ILO-3: PI-1, PI-2, PI-3)			
2	Ability to use the concept of the rational number system in constructing the real number system and its properties. (ILO-2: PI-1, PI-2, PI-3, ILO-3: PI-1, PI-2, PI-3)					

	3	Ability to generalize the concepts and properties of sets in real numbers. (ILO-2: PI-1, PI-2, PI-3, ILO-3: PI-1, PI-2, PI-3)
	4	Ability to explain the concept of continuity of a function and identify the properties of continuity for a real-valued function. (ILO-2: PI-1, PI-2, PI-3, ILO-3: PI-1, PI-2, PI-3)
	5	Ability to explain the concept of differential and integral calculus, identify the properties of derivatives and integral, and their relation to continuity. (ILO-2: PI-1, PI-2, PI-3, ILO-3: PI-1, PI-2, PI-3)
	6	Students can reason intuitively and analytically and can express the results of their reasoning in writing, systematically and rigorously. (ILO-3: PI-1, PI-2, PI-3)
Brief Description	This course begins by discussing how to construct a real number system through knowledge of the rational number system. Next, study the functions of one real-valued fruit related to continuity, derivatives, and integrals and sequences of functions.	
Course Materials	<ol style="list-style-type: none"> 1. Real number system 2. Continuous function 3. Differential calculus 4. Integral calculus 	
References	<p>Main:</p> <p>R. S. Strichartz. (2000). <i>The Way of Analysis</i>. Revised edition. Jones and Bartlett Publishers Inc., United States.</p> <p>Additional:</p> <p>R. G. Bartle and D. R. Sherbert. (2010). <i>Introduction to Real Analysis</i>, 4th edition, Wiley, New Jersey.</p>	
Learning Media	<p>Software:</p> <ul style="list-style-type: none"> • LMS Unand (http://fmipa.ilearn.unand.ac.id/) • Zoom meeting • Whatsapp 	<p>Hardware:</p> <ul style="list-style-type: none"> • Computer/Laptop • Smartphone
Team Teaching	<ol style="list-style-type: none"> 1. Dr. Haripamyu 2. Dr. Shelvi Ekariani 	
Assessment	Homework, Quizzes, Mid-Term exam, Final exam	
Required courses	-	

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)			
1,2	CLO-1: Students are able to explain the concept of a rational number system and identify applicable properties. (ILO-2, ILO-3)	<ul style="list-style-type: none"> • Discipline in carrying out college contracts • Accuracy in understanding related material 	Participation (2.5%) Midterm exam (10%) Independent Assignment (2.5%)	Teaching and discussion: - Explanation of Semester Learning Plan - Discussion about the material course [2 × 3 × 50] minutes		<ul style="list-style-type: none"> • Students read the references and learn the definition of the derivative function. • Students find the references, learn the course material on the relationship between derivatives and continuity functions, and prove the properties of derivatives. [2 x 3 x 120] minutes		<ul style="list-style-type: none"> • I learn (LMS Unand) 	<ul style="list-style-type: none"> • Introduction to Lectures (Assessment Rules, Semester Study Plan, Syllabus, Tuition Contract) • Quantor Logic • The set of infinite numbers • Proof • Rational number system 	15%

3-5	<p>CLO-2: Students are able to use the concept of a rational number system along with applicable properties in constructing real number systems and their properties. (ILO-2, ILO-3)</p> <p>CLO-6: Students are able to reason intuitively and analytically and are able to express the results of their reasoning in writing, systematically and rigorously. (ILO-3)</p>	<ul style="list-style-type: none"> • Accuracy in understanding related material • Accuracy in answering task questions • Neatness of task work • Originality of the results of the task 	<p>Midterm exam (7%+3%)</p> <p>Quiz (5%+5%)</p>	<p>Teaching and discussion:</p> <ul style="list-style-type: none"> - Explanation of the material concepts. - Discussion about the material course. <p>[3 × 3 × 50 menit]</p>		<p>Students read the references and learn the materials.</p> <p>[3 × 3 × 60 menit]</p>	<p>Students do the group discussion.</p>	<p>LMS (ilearn UNAND)</p>	<p>Construction of the real number system:</p> <ul style="list-style-type: none"> • Cauchy's sequence • Real number system as an ordered field 	20%
6-7	<p>CLO-3: Students are able to generalize the concepts and properties of sets in real numbers (ILO-2, ILO-3)</p>	<ul style="list-style-type: none"> • Accuracy in understanding related material • Accuracy in answering task questions • Neatness of 	<p>Midterm exam (7%+3%)</p> <p>Participation (2.5%)</p>	<p>Teaching and discussion:</p> <ul style="list-style-type: none"> - Explanation of the material concepts. 		<p>Students read the references and learn the materials.</p> <p>[2 × 3 × 60 menit]</p>	<p>Students do the group discussion.</p>	<p>LMS (ilearn UNAND)</p>	<p>Limit and completeness Topology on the real number line</p>	15%

	CLO-6: Students are able to reason intuitively and analytically and are able to express the results of their reasoning in writing, systematically and rigorously. (ILO-3)	task work • Originality of the results of the task	Assignment (2.5%)	- Discussion about the material course. [2 × 3 × 50 menit]						
8	MID-TERM EXAM									
9-10	CLO-4 Students are able to explain the concept of continuity of functions and identify the properties of continuity for the function of one real-value variable. (ILO-2, ILO-3) CLO-6: Students are able to reason intuitively and analytically and	<ul style="list-style-type: none"> • Accuracy in understanding related material • Accuracy in answering task questions • Neatness of task work • Originality of the results of the task 	Final exam (7%+3%) Participation (2.5%) Assignment (2.5%)	Teaching and discussion: - Explanation of the material concepts. - Discussion about the material course. [2 × 3 × 50 menit]		Students read the references and learn the materials. [2 × 3 × 60 menit]	Students do the group discussion.	LMS (ilearn UNAND)	Continuous Function	15%

	are able to express the results of their reasoning in writing, systematically and rigorously. (ILO-3)									
11-13	<p>CLO-5: Students are able to explain the concept of differential calculus and identify the properties of derivatives and their relation to continuity. (ILO-2, ILO-3)</p> <p>CLO-6: Students are able to reason intuitively and analytically and are able to express the results of their reasoning in writing, systematically and rigorously. (ILO-3)</p>	<ul style="list-style-type: none"> • Accuracy in explaining and understanding related material • Accuracy in answering quiz questions 	<p>Final exam (7%+3%)</p> <p>Quiz (5%)</p>	<p>Teaching and discussion:</p> <ul style="list-style-type: none"> - Explanation of the material concepts. - Discussion about the material course. <p>[3× 3 × 50 menit]</p>		<p>Students read the references and learn the materials.</p> <p>[3 × 3 × 60 menit]</p> <p>-</p>	<p>Students do the group discussion.</p>	<ul style="list-style-type: none"> • LMS (ilearn UNAND) • Zoom 	Differential Calculus	15%

14-15	<p>CLO-5: Students are able to explain the concept of integral calculus and identify integral properties. (ILO-2, ILO-3)</p> <p>CLO-6: Students are able to reason intuitively and analytically and are able to express the results of their reasoning in writing, systematically and rigorously. (ILO-3)</p>	<ul style="list-style-type: none"> • Accuracy in understanding related material • Accuracy in answering task questions • Neatness of task work • Originality of the results of the task 	<p>Final exam (7%+3%)</p> <p>Participation (2.5%)</p> <p>Assignment (2.5%)</p>	<p>Teaching and discussion:</p> <ul style="list-style-type: none"> - Explanation of the material concepts. - Discussion about the material course. <p>[2 × 3 × 50 menit]</p>		<p>Students read the references and learn the materials.</p> <p>[2 × 3 × 60 menit]</p>	<p>Students do the group discussion.</p>	<p>LMS (ilearn UNAND)</p>	<p>Integral Calculus</p>	<p>15%</p>
16	FINAL EXAM									
Total Weight										100%

1 credit = 50 minutes face-to-face meeting, 60 minutes structured study, 60 minutes independent study
Each meeting duration is 2 credits = 2×50 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	Assignment	10
4	Quiz	20
5	Participation	10
TOTAL		100

2. Assessment weight for Intended Learning Outcome

- CLO-1: 15 %
- CLO-2: 12 %
- CLO-3: 12 %
- CLO-4: 12 %
- CLO-5: 12 %
- CLO-6: 12%

Assessment Plan Table:

No.	CLO	Assessment				Assignment (%)	Weight (%)
		Mid-Term Exam (%)	Final Exam (%)	Quizzes (%)	Participation (%)		
1	Students are able to explain the concept of a rational number system and identify applicable properties (ILO-2: PI-1, PI-2, PI-3, ILO-3: PI-1, PI-2, PI-3).	10%			2.5%	2.5%	15%
2	Students are able to use the concept of a rational number system along with applicable properties in constructing real number systems and their properties (ILO-2: PI-1, PI-2, PI-3, ILO-3: PI-1, PI-2, PI-3).	7%		5%			12%
3	Students are able to generalize the concept and nature of sets in real numbers (ILO-2: PI-1, PI-2, PI-3; ILO-3: PI-1, PI-2, PI-3).	7%			2.5%	2.5%	12%
4	Students are able to explain the concept of continuity of functions and identify the properties of continuity for the function of one real-value variable (ILO-2: PI-1, PI-2, PI-3; ILO-3: PI-1, PI-2, PI-3).		7%		2.5%	2.5%	12%
5	Students are able to explain the concepts of differential calculus and integral calculus, identify the properties of derivatives and their relation to continuity (ILO-2: PI-1, PI-2, PI-3, ILO-3: PI-1, PI-2, PI-3).		7%	5%			12%
6	Students are able to reason intuitively and analytically and are able to express the results of their reasoning in writing, systematically and rigorously (ILO-3: PI-1, PI-2, PI-3).	6%	9%	10%			25%
Total		30%	30%	20%	10%	10%	100%

Information:

TK: Group ask

