SEMESTER STUDY PLAN CAPITA SELECTA ON APPLIED MATHEMATICS 2 / MAT61247 (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 1	Name		Course Code	URL I-L	earn	Credits	Semester	Compilation Date						
Capita Selecta on App (Introduction to Fract Differential	olied Mathe ional Orde Equation)	ematics 2 er Linear	MAT61247	https://sci.ilear	n.unand.ac.id	3	7	5 May 2024						
	<u> </u>		Study Pla	Study Plan Creator Head of Research Group Head of Study										
Person In	Charge		Prof. Dr. N	Muhafzan	Dr. Ahma	ad Iqbal Baqi	Dr. No	verina Alfiany						
	Intendeo	d Learning O	Learning Outcomes											
Intended Learning	ILO-1	Possesses a	a good ethics and	integrity										
Outcomes (ILO) and		PI-2: An ab	PI-2: An ability to act in accordance with academic ethics											
Performance Indicator		PI-3: An ability to act in accordance with academic integrity												
(PI)	ILO-2													
		PI-1: An a	bility to explain b	asic mathematica	al 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 problems												
		PI-1: An ability to identify simple mathematical problems												
		PI-2: An at	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 an	d fundamental te	echnique of m	athematics in sol	ving simple	mathematical						
		problems												
		PI-1: An ability to choose appropriate basic mathematical concepts and techniques in solving simple												
		math	ematical problem	ns										
		PI-3: An a	bility to solve sin	nple mathematica	al problems u	sing appropriate	basic mather	matical concepts						
		and t	echniques											
	ILO-5	An ability	formally and cor	rectly proves a si	mple mathem	atical statements	s using facts a	and methods that						
		have been	studied											
		PI-1: An a	bility to identify	the formal struct	ures and anal	ogous forms in n	nathematics							
		PI-2: An a	bility to use fact a	and apply metho	ds to prove si	mple mathemation	cal statement	ts						
		PI-3: An a	bility to present s	simple mathemat	ical statement	t proof rigorously	y (sequential	juentially and						

		conscientious)
		PI-4: An ability to conclude or interpret result of the proving simple mathematical statement
	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
	Course	Learning Outcomes
	1	Students are able to understand the concept of fractional calculus, especially fractional integrals and
	1	fractional derivatives. (ILO-1: ILO-3: ILO-4)
	2	Students are able to understand the Laplace transformation of both the fractional integrals and the
	Ζ	fractional derivatives. (ILO-1: ILO-3: ILO-4)
	3	Students are able to recognize the concept of linear fractional differential equations (ILO-2: ILO-3: ILO-4;
	4	Students master the technique of solving the linear fractional differential equations (ILO-2: ILO-3: ILO-4; ILO-5)
	5	Students master the technique of solving the system of the linear fractional differential equations (ILO-2: ILO-3: ILO-4; ILO-5)
	6	Students are able to solve boundary value problems for the linear fractional differential equations. (ILO-2: ILO-3: ILO-4; ILO-5; ILO-7)
	7	Students are able to use the Matlab software to solve the linear fractional differential equations. (ILO-2: ILO-3: ILO-4; ILO-5; ILO-7)
Brief Description	The lect Then th concept bounda	ture begins by introducing the concept of the fractional calculus and the associated Laplace transform. The definition and classification of the fractional differential equations are introduced as well. Then the to of the linear fractional differential equations, systems of the linear fractional differential equations and ary value problems for the linear fractional differential equations are introduced.
	This con other for for a ba related	urse is equipped with self-study activities through practice problems, discussion/review of material, and orms of learning. Furthermore, to meet the demands of global developments in the mastery of technology chelor of mathematics, participants of this course are also equipped with the skills to use Matlab software to the linear fractional differential equations.
Course Materials	1. H 2. H 3. S 4. H 5. U	Fractional Calculus and the associated Laplace transformation Fractional linear differential equations System of the fractional linear differential equations Boundary problem for the fractional linear differential equations Use of Matlab software to find the solution of the fractional linear differential equations

References	Main:	
	[1]. C. Milici, G. Draganescu, J. T. M	achado, Introduction to Fractional Differential Equations, Springer, 2019
	Additional:	
	[2]. I. Podlubny, Fractional Differen	tial Equations, Academic Press, 1999
Learning Media	Software:	Hardware:
	• LMS Unand	Computer/Laptop
	(http://fmipa.ilearn.unand.ac.id/)	• Smartphone
	• Zoom meeting	1
	• Whatsapp	
Team Teaching	1. Prof. Dr. Muhafzan	
	2. Dr. Noverina Alfiany	
Assessment	Homework(assignment), Mid-Term	exam, Final exam
D		
Required courses	MAT61122 Calculus I	
	MA161142 Ordinary Differential Eq	uation (2000 co
Academic Norms	https://akademik.unand.ac.id/images	<u>/ 2022-03-</u>
	<u>30%20Peraturan%20Kektor%20Nomor</u>	%207%20Fanun%202022%20Penyelenggaraan%20Pendidikan-
	khusus%20Bab%20II.pdf	

Weekly Study Plan

Week/ Meet	Course	Indicator	Assessment	Synchi	ronous*	nous**		Subject,	Weight	
(1)	Outcomes (2)	(3)	(4)	Face to face Offline (5)	Face to face Online (6)	Individual (7)	Collaborati on (8)	Media (9)	references (10)	(11)
1-2	CLO-1 Able to understand the concept of fractional calculus, especially fractional integrals and fractional derivatives	 Discipline in implementing the lecture contract Accuracy in understanding related material Accuracy in answering assignment questions Neatness of assignment work Originality of assignment results 	Assignment : 3% Mid term: 7%	 Teaching and discussion: Explanation of Semester Learning Plan explanation of learning material explanation of the task explanation of the task explanation of the task explanation of the assessment [2 × 3 × 50 minutes] 	 Teaching and discussion: Explanation of Semester Learning Plan explanation of learning material explanation of the task explanation of the assessment 2 × 3 × 50 minutes] 	 Students read and study learning materials Students do assignments independently [2× 3 × 120 minutes] 		 PPT I learn (LMS Unand) (Specific condition: Zoom meeting, WA group, learning video) 	 Assessment Rules, SSP, Course Contract Fractional Calculus and the associated Laplace transformati on [1] 	10%
3-4	CLO-2 Able to understand the Laplace transformation of both the fractional integrals and the fractional derivatives	 Accuracy in understanding related material Accuracy in answering assignment questions Neatness of assignment work 	Assignment : 5% Mid term: 15%	 Lecture: explanation of concepts discussion, question and answer of lecture material X 3 × 50 minutes 	 Lecture: explanation of concepts discussion, question and answer of lecture material × 3 × 50 minutes 	 Students read and study learning materials Students do assignments independently [2× 3 × 120 minutes] 		 PPT I learn (LMS Unand) (Specific condition: Zoom meeting, WA group, 	Fractional Calculus and the associated Laplace transformation [1]	20%

		• Originality of assignment results					learning video)		
5-7	CLO-3 Able to recognize the concept of linear fractional differential equations CLO-4 Mastering in solving the linear fractional differential equations	 Accuracy in understanding related material Accuracy in answering assignment questions Neatness of assignment work Originality of assignment results 	Assignment : 5% Mid term: 15%	 Lecture: explanation of concepts discussion, question and answer of lecture material X X X 50 minutes 	 Lecture: explanation of concepts discussion, question and answer of lecture material X X X 50 minutes 	 Students read and study learning materials Students do assignments independently [3× 3 × 120 minutes] 	 PPT I learn (LMS Unand) (Specific condition: Zoom meeting, WA group, learning video) 	Fractional linear differential equations [1, 2]	20%
8-9					MID-TERM EX	AM			
10-12	CLO-5 Mastering in solving system of the linear fractional differential equations CLO -7 Able to use the Matlab software to solve the linear fractional differential equations	 Accuracy in understanding related material Accuracy in answering assignment questions Neatness of assignment work Originality of assignment results 	Assignment : 5% Final term: 20%	 Lecture: explanation of concepts discussion, question and answer of lecture material X X X 50 minutes 	 Lecture: explanation of concepts discussion, question and answer of lecture material X X X 50 minutes 	 Students read and study learning materials Students do assignments independently [3× 3 × 120 minutes] 	 PPT I learn (LMS Unand) (Specific condition: Zoom meeting, WA group, learning video) 	 System of the fractional linear differential equations Use of Matlab software to find the solution of the fractional linear differential equations [1, 2] 	25%

13-16	CLO -6 Able to solve boundary value problems for the linear fractional differential equations CLO -7 Able to use the Matlab software to solve the linear fractional differential equations	 Accuracy in understanding related material Accuracy in answering assignment questions Neatness of assignment work Originality of assignment results 	Assignment : 5% Final term: 20%	 Lecture: explanation of concepts discussion, question and answer of lecture material (4 × 3 × 50 minutes] 	 Lecture: explanation of concepts discussion, question and answer of lecture material (4 × 3 × 50 minutes] 	 Students read and study learning materials Students do assignments independently [4× 3 × 120 minutes] - 	 PPT I learn (LMS Unand) (Specific condition: Zoom meeting, WA group, learning video) 	 Boundary problem for the fractional linear differential equation Use of Matlab software to find the solution of the fractional linear differential equations [1, 2] 	25%
17-18					FINAL EXA	M		10tur Preight	100 /0

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	40
2	Final Exam	40
3	Assignment (Homework)	20
	TOTAL	100

2. Assessment weight for Intended Learning Outcome

- CLO-1:7 %
- CLO-2:7 %
- CLO-3: 20 %
- CLO- 4: 20 %
- CLO-5: 20 %
- CLO-6: 20%
- CLO-7:6%

Assessment Plan Table:

1000000					
No	CLO		Waigth (%)		
190.	CLO	Homework (%)	Mid-Term Exam (%)	Final Exam (%)	weigin (70)
	Students are able to understand the concept of				
1	fractional calculus, especially fractional integrals	1	3	3	7
	and fractional derivatives. (ILO-1: ILO-3: ILO-4)				
	Students are able to understand the Laplace				
2	transformation of both the fractional integrals and	1	3	3	7
	the fractional derivatives. (ILO-1: ILO-3: ILO-4)				
	Students are able to recognize the concept of linear				
3	fractional differential equations (ILO-2: ILO-3: ILO-	4	8	8	20
	4; ILO-5)				
4	Students master the technique of solving the linear	4	0	0	20
4	fractional differential equations (ILO-2: ILO-3: ILO-4;	4	ð	ð	20

	ILO-5)				
	Students master the technique of solving the system				
5	of the linear fractional differential equations (ILO-2:	4	8	8	20
	ILO-3: ILO-4; ILO-5)				
	Students are able to solve boundary value problems				
6	for the linear fractional differential equations. (ILO-	4	8	8	20
	2: ILO-3: ILO-4; ILO-5; ILO-7)				
	Students are able to use the Matlab software to solve				
7	the linear fractional differential equations. (ILO-2:	2	2	2	6
	ILO-3: ILO-4; ILO-5; ILO-7)				
	Total	20	40	40	100

																IL	<i>.</i> O															
CLO		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		✓	\checkmark				~	~	\checkmark	~		✓																				
2				✓		✓	\checkmark	✓	~	\checkmark		✓	\checkmark	\checkmark	✓	✓																
3				~		✓	~	✓	\checkmark	~		✓	✓	~	~	✓																
4				~		~	~	✓	\checkmark	~		✓	~	~	~	~																
5				\checkmark		\checkmark	\checkmark	<	\checkmark	\checkmark		✓	✓	~	✓	✓						~	<	<	~	\checkmark	~	~				