

SEMESTER STUDY PLAN
CAPITA SELECTA ON APPLIED MATHEMATICS 1 / MAT62247
(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
Capita Selecta on Applied Mathematics 1 (Introduction to Discrete Dynamical System)		MAT62247	https://sci.ilearn.unand.ac.id	3	6	5 May 2024
Person In Charge		Study Plan Creator		Head of Research Group		Head of Study Program
		Prof. Dr. Muhafzan		Dr. Ahmad Iqbal Baqi		Dr. Noverina Alfiany
Intended Learning Outcomes (ILO) and Performance Indicator (PI)	Intended Learning Outcomes					
	ILO-1	Possesses a good ethics and integrity PI-2: An ability to act in accordance with academic ethics PI-3: An ability to act in accordance with academic integrity				
	ILO-2	Possesses profound knowledge of the basic concept mathematics PI-1: An ability to explain 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 problems 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-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 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-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 explain the basic concepts of difference calculus. (ILO-1: ILO-3: ILO-4)
	2	Students are able to explain the basic concepts, initial value problems, solution of difference equations and identify the classification of difference equations (ILO-2: ILO-3: ILO-4; ILO-5)
	3	Students are able to solve linear difference equations of various types with appropriate methods (ILO-2: ILO-3: ILO-4; ILO-5)
	4	Students are able to understand the concept of Z transformation and its use to solve the linear difference equations. (ILO-2: ILO-3: ILO-4; ILO-5)
	5	Students are able to understand Putzer's method for matrix powering and its use to solve the system of linear difference equations. (ILO-2: ILO-3: ILO-4; ILO-5; ILO-7)
	6	Students are able to understand the qualitative behavior of the linear difference equation systems and are able to use Matlab to study this behavior. (ILO-2: ILO-3: ILO-4; ILO-5; ILO-7)
Brief Description	<p>This course introduces difference calculus. Then the definition and classification of difference equations are discussed. This is followed by an explanation of first-order and second-order difference equations, the derivation of solution methods and some examples of their application in real problems. The next discussion is about higher order difference equations and systems of linear difference equations. It then discusses the concept of Z transformation and its application in solving linear difference equations. Finally, the qualitative behavior of the system of linear difference equations is discussed.</p> <p>This course is equipped with self-study activities through practice problems, discussion/review of material, and other forms of learning. Furthermore, to meet the demands of global developments in the mastery of technology for a bachelor of mathematics, participants of this course are also equipped with the skills to use Matlab software related to the qualitative behavior of linear difference equation systems through demonstration activities in front of the class.</p>	

Course Materials	<ol style="list-style-type: none"> 1. Calculus difference 2. Linear difference equations 3. System of linear difference equation 4. Z transformation and its use to solve the system of linear difference equation 5. Putzer's method for matrix powering and its use to solve the system of linear difference equation 6. The qualitative behavior of the linear difference equation systems 7. Use of Matlab software to learn the qualitative behavior of the linear difference equation systems. 	
References	<p>Main:</p> <p>[1]. W. G. Kelley, A. C. Peterson, Difference Equations, Harcourt/ Academic Press, USA, 2001</p> <p>Additional:</p> <p>[2]. Saber Elaydi, An Introduction to Difference Equations, Springer, New York, 2005.</p> <p>[3]. Galor Oded, Discrete Dynamical System, Springer, New York, 2007.</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. Prof. Dr. Muhafzan 2. Dr. Noverina Alfiany 	
Assessment	Homework(assignment), Mid-Term exam, Final exam	
Required courses	MAT61142 Ordinary Differential Equation	
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)	Collaborati on (8)			
1-2	CLO-1 Able to explain the basic concepts of difference calculus	<ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> - Explanation of Semester Learning Plan - explanation of learning material - explanation of the task - explanation of the assessment [2 × 3 × 50 minutes]	Teaching and discussion: <ul style="list-style-type: none"> - Explanation of Semester Learning Plan - explanation of learning material - explanation of the task - explanation of the assessment 2 × 3 × 50 minutes]	<ul style="list-style-type: none"> • Students read and study learning materials • Students do assignments independently [2 × 3 × 120 minutes] 		<ul style="list-style-type: none"> • PPT • I learn (LMS Unand) (Specific condition: Zoom meeting, WA group, learning video)	<ul style="list-style-type: none"> • Assessment Rules, SSP, Course Contract • Basic concept • Calculus difference [1] 	10%

3-4	CLO-2 Able to explain the basic concepts, initial value problems, solution of difference equations and identify the classification of difference equations CLO-3 Able to solve linear difference equations of various types with appropriate methods	<ul style="list-style-type: none"> • Accuracy in understanding related material • Accuracy in answering assignment questions • Neatness of assignment work • Originality of assignment results 	Assignment : 5% Mid term: 15%	<ul style="list-style-type: none"> • Lecture: - explanation of concepts - discussion, question and answer of lecture material [2 × 3 × 50 minutes] 	<ul style="list-style-type: none"> • Lecture: - explanation of concepts - discussion, question and answer of lecture material [2 × 3 × 50 minutes] 	<ul style="list-style-type: none"> • Students read and study learning materials • Students do assignments independently [2× 3 × 120 minutes] 		<ul style="list-style-type: none"> • PPT • I learn (LMS Unand) •(Specific condition: Zoom meeting, WA group, learning video) 	<ul style="list-style-type: none"> • Linear difference equations [1] 	20%
5-7	CLO-3 Able to solve linear difference equations of various types with appropriate methods CLO-4 Able to understand the concept of Z transformation and its use to solve the linear difference equations.	<ul style="list-style-type: none"> • Accuracy in understanding related material • Accuracy in answering assignment questions • Neatness of assignment work • Originality of assignment results 	Assignment : 5% Mid term: 15%	<ul style="list-style-type: none"> • Lecture: - explanation of concepts - discussion, question and answer of lecture material [3 × 3 × 50 minutes] 	<ul style="list-style-type: none"> • Lecture: - explanation of concepts - discussion, question and answer of lecture material [3 × 3 × 50 minutes] 	<ul style="list-style-type: none"> • Students read and study learning materials • Students do assignments independently [3× 3 × 120 minutes] 		<ul style="list-style-type: none"> • PPT • I learn (LMS Unand) • (Specific condition: Zoom meeting, WA group, learning video) 	<ul style="list-style-type: none"> • Linear difference equations (methods to solve the linear difference equation) • Z transformation [1, 2] 	20%
8-9	MID-TERM EXAM									

10-11	CLO-4 Able to understand the concept of Z transformation and its use to solve the linear difference equations.	<ul style="list-style-type: none"> • Accuracy in understanding related material • Accuracy in answering assignment questions • Neatness of assignment work • Originality of assignment results 	Assignment : 3% Final term: 7%	<ul style="list-style-type: none"> • Lecture: - explanation of concepts - discussion, question and answer of lecture material [2 × 3 × 50 minutes] 	<ul style="list-style-type: none"> • Lecture: - explanation of concepts - discussion, question and answer of lecture material [2 × 3 × 60 minutes] 	<ul style="list-style-type: none"> • Students read and study learning materials • Students do assignments independently [2 × 3 × 120 minutes] 		<ul style="list-style-type: none"> • PPT • I learn (LMS Unand) • (Specific condition: Zoom meeting, WA group, learning video) 	Z transformation to solve the linear difference equation [1, 2]	10%
12-13	CLO -5 Able to understand Putzer's method for matrix powering and its use to solve the system of linear difference equations	<ul style="list-style-type: none"> • Accuracy in understanding related material • Accuracy in answering assignment questions • Neatness of assignment work • Originality of assignment results 	Assignment : 5% Final term: 15%	<ul style="list-style-type: none"> • Lecture: - explanation of concepts - discussion, question and answer of lecture material [2 × 3 × 50 minutes] 	<ul style="list-style-type: none"> • Lecture: - explanation of concepts - discussion, question and answer of lecture material [2 × 3 × 50 minutes] 	<ul style="list-style-type: none"> • Students read and study learning materials • Students do assignments independently [2 × 3 × 120 minutes] - 		<ul style="list-style-type: none"> • PPT • I learn (LMS Unand) • (Specific condition: Zoom meeting, WA group, learning video) 	Putzer's method for matrix powering and its use to solve the system of linear difference equations [1, 2]	20%
14-16	CLO -6 Able to understand the qualitative behavior of the linear difference equation systems and are able to use Matlab to study this behavior	<ul style="list-style-type: none"> • Accuracy in understanding related material • Accuracy in answering assignment questions • Neatness of assignment work 	Assignment : 5% Final term: 15%	<ul style="list-style-type: none"> - Presentation project by students [3 × 3 × 50 minutes] 	<ul style="list-style-type: none"> • Lecture: - explanation of concepts - discussion, question and answer of lecture material [3 × 3 × 50 minutes] 	<ul style="list-style-type: none"> • Students read and study learning materials • Students do assignments independently [3 × 3 × 60 minutes] 	Students present the project outcomes [3 × 3 × 60 minutes]	<ul style="list-style-type: none"> • PPT • I learn (LMS Unand) • (Specific condition: Zoom meeting, WA group, learning video) 	<ul style="list-style-type: none"> • The qualitative behavior of the linear difference equation systems • Use of Matlab software to learn the 	20%

		<ul style="list-style-type: none"> Originality of assignment results 							qualitative behavior of the linear difference equation systems. [1, 3]	
Total Weight										100%
17-18	FINAL EXAM									

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	40
2	Final Exam	40
3	Assignment (Homework)	20
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			Weigth (%)
		Homework (%)	Mid-Term Exam (%)	Final Exam (%)	
1	Students are able to explain the basic concepts of difference calculus. (ILO-1: ILO-3: ILO-4)	2	4	4	10
2	Students are able to explain the basic concepts, initial value problems, solution of difference equations and identify the classification of difference equations (ILO-2: ILO-3: ILO-4; ILO-5)	2	4	4	10
3	Students are able to solve linear difference equations of various types with appropriate methods (ILO-2: ILO-3: ILO-4; ILO-5)	4	8	8	20
4	Students are able to understand the concept of Z transformation and its use to solve the linear difference equations. (ILO-2: ILO-3: ILO-4; ILO-5)	4	8	8	20
5	Students are able to understand Putzer's method for matrix powering and its use to solve the system of linear difference equations. (ILO-2: ILO-3: ILO-4; ILO-5; ILO-7)	4	8	8	20
6	Students are able to understand the qualitative behavior of the linear difference equation systems and are able to use Matlab to study this behavior. (ILO-2: ILO-3: ILO-4; ILO-5; ILO-7)	4	8	8	20
Total		20	40	40	100