

SEMESTER STUDY PLAN
CAPITA SELECTA ON COMBINATORICS MATHEMATIC 1
(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 of Combinatorics Mathematic 1		MAT62233	https://sci.ilearn.unand.ac.id	3	2	14 May 2024
Person In Charge		Study Plan Creator			Head of Research Group		Head of Study Program	
		Dr. Des Welyyanti			Prof. Dr. Syafrizal Sy		Dr. Noverina Alfiany	
Intended Learning Outcomes (ILO) and Performance Indicator (PI)	Intended Learning Outcomes							
	ILO-1	Possesses a good ethics and integrity PI-1: An ability to explain academic 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-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 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-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 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-6	Have ability data literacy and technology and can apply them in solving simple mathematical problems or other relevant fields PI-1: An ability to identify the right data and technology to solve simple mathematical problems or other fields PI-2: An ability to use data and technology and apply them to solve simple mathematical statements or other areas PI-3: An ability to process data using available technology in simple mathematical problems or other fields PI-4: An ability to conclude and interpret data processing results for simple mathematical problems or other fields PI-5: An ability to design an algorithm to solve simple mathematical problems or other fields
	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
	ILO-8	An ability to work in team PI-1: An ability to actively participate in a team with full responsibility PI-2: An ability to respond well to any feedback within the team

		PI-3: An ability to complete tasks according to the set schedule PI-4: An ability to adapt in a team
	ILO-9	An ability to apply knowledge of mathematics in career and involve in life long 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 PI-3: An ability to prepare and realize final project plans PI-4: An ability to use mathematical concepts in identifying business opportunities
	Course Learning Outcomes	
	1	An ability to understand of the concept of connectivity, rainbow connection numbers and strong rainbow connections; and can determine the number of rainbow connections and strong rainbow connections from a given graph(ILO-4: PI-1, PI-2, PI-3: ILO-5: PI-1, PI-2, PI-3, PI-4).
	2	An ability to understand of the concepts of magic-edge (super) labeling, magic-vertex (super) labeling, magic-total (super) labeling; and can determine labeling with the required properties for a given graph (ILO-4: PI-1, PI-2, PI-3: ILO-5: PI-1, PI-2, PI-3, PI-4)
	3	An ability to understand of the concepts of (super)(a,d)-edge-anti-magic labeling, labeling (super)(a,d)-vertex-anti-magic; and can determine labeling with the required properties for a given graph(ILO-4: PI-1, PI-2, PI-3: ILO-5: PI-1, PI-2, PI-3, PI-4).
Brief Description	In this course, several concepts in graph theory are discussed, including several types of labeling on graphs, including magic, anti-magic and magic total labels, as well as the concepts of Rainbow Connection and Strong Rainbow Connection numbers. Next, some of the latest results related to these topics are presented	

Course Materials	• Connectivity and edge coloring • Rainbow Connection Number and Strong Rainbow Connection • Labeling on graphs: edge labeling, vertex labeling and total labeling • Magic labeling: Magic edge labeling, magic vertex labeling, magic total labeling, magic constant (a,d)-anti magic labeling: (a,d)-anti magic labeling, (a,d)-anti magic labeling	
References	Main: 1. Chartrand, G., Zhang, P., <i>Introduction to Graph Theory</i>, McGraw-Hill, New York, 1st ed, 2005. Additional: 1. Baca, M., Miller, M., <i>Super Edge-Antimagic Graphs: A Wealth of Problems and Some Solutions</i>, Brown Walker Press, 2008.. https://mathematicalolympiads.files.wordpress.com/2012/08/lineer-algebra2.pdf	
Learning Media	Software: • LMS Unand (http://fmipa.ilearn.unand.ac.id/) • Zoom meeting • Whatsapp	Hardware: • Computer/Laptop • Smartphone
Team Teaching	1. Dr. Des Welyyanti 2. Dr. Lyra Yulianti	
Assessment	Homework, Quizzes, Mid-Term exam, Final exam	
Required courses	MAT62131 Discrete Mathematics, MAT61231 Introduction to Graph Theory	
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)			
1/1	CLO-1 Ability to understand of the concept of connectivity, rainbow connection numbers and strong rainbow connections; and can determine the number of	• Accuracy in determining properties of graph • Accuracy in determining operation on graph	Non test : Test Quiz 1: 5% MIT: 5%	Teaching and discussion: - Explanation of learning material - Explanation of the task - explanation of the assessment [1 x 3 x 50 minutes]	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment [3x 50 minutes]	• Students read and study learning materials • Students do assignments independently to solve Properties of graph and Operation on graph		• PPT • I learn (LMS Unand) (Specific condition: Zoom meeting, WA group, learning video)	• Tuition Contract • Properties of graph • Operation on graph	10%

	rainbow connections and strong rainbow connections from a given graph(ILO-4: PI-1, PI-2, PI-3: ILO-5: PI-1, PI-2, PI-3, PI-4)				(Specific conditions: The total number of blended learning meetings is 40% of the total number of meetings)					
2/2	CLO-1 Ability to understand of the concept of connectivity, rainbow connection numbers and strong rainbow connections; and can determine the number of rainbow connections and strong rainbow connections from a given graph(ILO-4: PI-1, PI-2, PI-3: ILO-5: PI-1, PI-2, PI-3, PI-4)	• Accuracy in determining Rainbow connection • Accuracy in determining Strong Rainbow connection	Non test : Test Quiz 2: 5% MIT: 5%	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment [1 x 3 x 50 minutes]	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment [3x 50 minutes] (Specific conditions: The total number of blended learning meetings is 40% of the	• Students read and study learning materials • Students do assignments independently to Rainbow connection and Strong Rainbow connection		• PPT • I learn (LMS Unand) • (Specific condition: Zoom meeting, WA group, learning video)	• Rainbow connection • Strong Rainbow connection	10%

					total number of meetings)					
3/3	CLO-1 Ability to understand of the concept of connectivity, rainbow connection numbers and strong rainbow connections; and can determine the number of rainbow connections and strong rainbow connections from a given graph(ILO-4: PI-1, PI-2, PI-3: ILO-5: PI-1, PI-2, PI-3, PI-4)	Accuracy in determining Graph order n has rainbow number 2	Non test : HW 15% Test	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment [1 x 3 x 50 minutes]	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment [3x 50 minutes] (Specific conditions: The total number of blended learning meetings is 40% of the total number of meetings)	- Students read and study learning materials - Students do assignments independently to solve Graph order n has rainbow number 2		- PPT - I learn (LMS Unand) (Specific condition: Zoom meeting, WA group, learning video)	Graph order n has rainbow number 2	5%
4/4	CLO-1 Ability to understand of the concept of connectivity, rainbow	Accuracy in determining Graph order n has rainbow number 3	Non test : Test MIT: 5%	Teaching and discussion: - explanation of learning material	Teaching and discussion: - explanation of learning material	Students read and study learning materials		- PPT - I learn (LMS Unand)	Graph order n has rainbow number 3	5%

	connection numbers and strong rainbow connections; and can determine the number of rainbow connections and strong rainbow connections from a given graph(ILO-4: PI-1, PI-2, PI-3: ILO-5: PI-1, PI-2, PI-3, PI-4)			- explanation of the task - explanation of the assessment [1 x 3 x 50 minutes]	- explanation of the task - explanation of the assessment [3x 50 minutes] (Specific conditions: The total number of blended learning meetings is 40% of the total number of meetings)	Students do assignments independently to solve Graph order n has rainbow number 3		(Specific condition: Zoom meeting, WA group, learning video)		
5/5	CLO-1 Ability to understand of the concept of connectivity, rainbow connection numbers and strong rainbow connections; and can determine the number of rainbow connections	• Accuracy in determining Join Operation graph • Accuracy in determining Rainbow number of join graph	Non test : HW 2 5% Test MIT: 5%	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment [1 x 3 x 50 minutes]	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment [3x 50 minutes]	• Students read and study learning materials - Students do assignments independently to solve Rainbow number of join graph		• PPT • I learn (LMS Unand) • (Specific condition: Zoom meeting, WA group, learning video)	• Join Operation graph • Strong Rainbow number of join graph	10%

	and strong rainbow connections from a given graph(ILO-4: PI-1, PI-2, PI-3: ILO-5: PI-1, PI-2, PI-3, PI-4)				(Specific conditions: The total number of blended learning meetings is 40% of the total number of meetings)					
6/6	CLO-1 Ability to understand of the concept of connectivity, rainbow connection numbers and strong rainbow connections; and can determine the number of rainbow connections and strong rainbow connections from a given graph(ILO-4: PI-1, PI-2, PI-3: ILO-5: PI-1, PI-2, PI-3, PI-4)	• Accuracy in determining Cartesian operation graph • Accuracy in determining Strong Rainbow number of cartesian graph •	Non test : Test MIT: 5%	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment [1 x 3 x 50 minutes]	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment [3x 50 minutes] (Specific conditions: The total number of blended learning meetings is 40% of the	• Students read and study learning materials - Students do assignments independently to solve Rainbow number of cartesian graph -		• PPT • I learn (LMS Unand) • (Specific condition: Zoom meeting, WA group, learning video)	• Cartesian operation graph • Strong Rainbow number of cartesian graph	5%

					total number of meetings)					
7/7	CLO-1 Ability to understand of the concept of connectivity, rainbow connection numbers and strong rainbow connections; and can determine the number of rainbow connections and strong rainbow connections from a given graph(ILO-4: PI-1, PI-2, PI-3: ILO-5: PI-1, PI-2, PI-3, PI-4)	• Accuracy in determining Amalgamation Graph • Accuracy in determining Strong rainbow connection amalgamation graph	Non test : Test MIT: 5%	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment [1 x 3 x 50 minutes]	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment [3x 50 minutes] (Specific conditions: The total number of blended learning meetings is 40% of the total number of meetings)	• Students read and study learning materials • Students do assignments independently to solve Strong rainbow connection amalgamation graph		• PPT • I learn (LMS Unand) • (Specific condition: Zoom meeting, WA group, learning video)	• Amalgamation Graph • Strong rainbow connection amalgamation graph	5%
8	MID-TERM EXAM									
9/9	CLO 2 Ability to understand of the concepts of magic-edge	• Accuracy in determining all type labeling	Non test : Test Quiz 3: 5% MIT: 5%	Teaching and discussion:	Teaching and discussion:	• Students read and study learning materials		• PPT • I learn (LMS Unand)	• Vertex labeling • Edge labeling	10%

	(super) labeling, magic-vertex (super) labeling, magic-total (super) labeling; and can determine labeling with the required properties for a given graph (ILO-4: PI-1, PI-2, PI-3; ILO-5: PI-1, PI-2, PI-3, PI-4)			- explanation of learning material - explanation of the task - explanation of the assessment [1 x 3 x 50 minutes]	- explanation of learning material - explanation of the task - explanation of the assessment [3x 50 minutes] (Specific conditions: The total number of blended learning meetings is 40% of the total number of meetings)	• Students do assignments independently to all type labeling -		• (Specific condition: Zoom meeting, WA group, learning video)	• Total labeling • Super Labbeling • Magic labeling • Magic Vertek labeling • Magic Edge labeling • Super Magic labeling	
10/10	CLO 2 Ability to understand of the concepts of magic-edge (super) labeling, magic-vertex (super) labeling, magic-total (super)	• Accuracy in determining Some Result of magic edge labeling	Non test : Test Quiz 4: 5% MIT: 5%	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment	• Students read and study learning materials - Students do assignments independently to solve Some Result of magic edge labeling		• PPT • I learn (LMS Unand) • (Specific condition: Zoom meeting, WA group, learning video)	• Some Result of magic edge labeling	10%

	labeling; and can determine labeling with the required properties for a given graph (ILO-4: PI-1, PI-2, PI-3; ILO-5: PI-1, PI-2, PI-3, PI-4)			[1 x 3 x 50 minutes]	[3x 50 minutes] (Specific conditions: The total number of blended learning meetings is 40% of the total number of meetings)	-				
11/11	CLO 2 Ability to understand of the concepts of magic-edge (super) labeling, magic-vertex (super) labeling, magic-total (super) labeling; and can determine labeling with the required properties for a given graph (ILO-4: PI-1, PI-2, PI-3; ILO-5: PI-1,	Accuracy in determining Some Result of magic vertex labeling and magic total labeling	Non test : HW 3 5% Test	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment [1 x 3 x 50 minutes]	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment [3x 50 minutes] (Specific conditions: The total number of blended learning	- Students read and study learning materials - Students do assignments independently to solve Some Result of magic vertex labeling and magic total labeling		- PPT - I learn (LMS Unand) (Specific condition: Zoom meeting, WA group, learning video)	Some Result of magic vertex labeling and magic total labeling	5%

	PI-2, PI-3, PI-4)				meetings is 40% of the total number of meetings)					
12/12	CLO 3 Ability to understand of the concepts of (super)(a,d)-edge-anti-magic labeling (super)(a,d)-vertex-anti-magic; and can determine labeling with the required properties for a given graph(ILO-4:	• Accuracy in determining (a,d) edge anti magic labeling • Accuracy in determining (a,d) vertex anti magic labeling	Non test : Test MIT: 5%	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment [1 x 3 x 50 minutes]	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment [3x 50 minutes] (Specific conditions:	• Students read and study learning materials • Students do assignments independently to solve (a,d) edge and vertex anti magic labeling		• PPT • I learn (LMS Unand) • (Specific condition: Zoom meeting, WA group, learning video)	• (a,d) edge anti magic labeling • (a,d) vertex anti magic labeling	5%

	PI-1, PI-2, PI-3: ILO-5: PI-1, PI-2, PI-3, PI-4).				The total number of blended learning meetings is 40% of the total number of meetings)					
13/13	CLO 3 Ability to understand of the concepts of (super)(a,d)-edge-anti-magic labeling, labeling (super)(a,d)-vertex-anti-magic; and can determine labeling with the required properties for a given graph(ILO-4: PI-1, PI-2, PI-3: ILO-5: PI-1, PI-2, PI-3, PI-4).	Accuracy in determining Some Results of (a,d) vertex anti magic labeling	Non test : HW 5% Test MIT: 5%	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment [1 x 3 x 50 minutes]	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment [3x 50 minutes] (Specific conditions: The total number of blended learning meetings is 40% of the total number of meetings)	- Students read and study learning materials - Students do assignments independently to solve Some Results of (a,d) vertex anti magic labeling		- PPT - I learn (LMS Unand) (Specific condition: Zoom meeting, WA group, learning video)	Some Results of (a,d) vertex anti magic labeling	10%

14/14	CLO 3 Ability to understand of the concepts of (super)(a,d)-edge-anti-magic labeling, (super)(a,d)-vertex-anti-magic; and can determine labeling with the required properties for a given graph(ILO-4: PI-1, PI-2, PI-3: ILO-5: PI-1, PI-2, PI-3, PI-4).	Accuracy in determining Some Results of (a,d) vertex anti magic labeling	Non test : Test MIT: 5%	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment [1 x 3 x 50 minutes]	Teaching and discussion: - explanation of learning material - explanation of the task - explanation of the assessment [3x 50 minutes] (Specific conditions: The total number of blended learning meetings is 40% of the total number of meetings)	• Students read and study learning materials - Students do assignments independently to Some Results of (a,d) vertex anti magic labeling		• PPT • I learn (LMS Unand) • (Specific condition: Zoom meeting, WA group, learning video)	• Some Results of (a,d) vertex anti magic labeling	5%
15/15	CLO 3 Ability to understand of the concepts of (super)(a,d)-edge-anti-magic labeling,	• Accuracy in determining - Review all Result of type labeling	Non test : Test MIT: 5%	Teaching and discussion: - explanation of learning material - explanation of the task	Teaching and discussion: - explanation of learning material - explanation of the task	• Students read and study learning materials • Students do assignments independentl y to review all		• PPT • I learn (LMS Unand) (Specific condition: Zoom meeting, WA	• Review all Result of type labeling	5%

	labeling (super)(a,d)-vertex-anti-magic; and can determine labeling with the required properties for a given graph(ILO-4: PI-1, PI-2, PI-3: ILO-5: PI-1, PI-2, PI-3, PI-4).			- explanation of the assessment [1 x 3 x 50 minutes]	- explanation of the assessment [3x 50 minutes] (Specific conditions: The total number of blended learning meetings is 40% of the total number of meetings)	Result of type labeling		group, learning video)		
									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 2 credits = 2x50 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	Homework	20
4	Quiz	20
TOTAL		100

2. Assessment weight for Intended Learning Outcome

- CLO-1: 50 %
- CLO-2: 25 %
- CLO-3: 25 %

Assessment Plan Table:

No.	CLO	Assessment				Weight (%)
		Homework (%)	Quizzes (%)	Mid-Term Exam (%)	Final Exam (%)	
1	Ability to understand of the concept of connectivity, rainbow connection numbers and strong rainbow connections; and can determine the number of rainbow connections and strong rainbow connections from a given graph(ILO-4: PI-1, PI-2, PI-3: ILO-5: PI-1, PI-2, PI-3, PI-4)	10	10	30		50
2	CLO 2 Ability to understand of the concepts of magic-edge (super) labeling, magic-vertex (super) labeling, magic-total (super) labeling; and can determine labeling with the	5	10	10		25

	required properties for a given graph (ILO-4: PI-1, PI-2, PI-3: ILO-5: PI-1, PI-2, PI-3, PI-4)					
3	Ability to understand of the concepts of (super)(a,d)-edge-anti-magic labeling, labeling (super)(a,d)-vertex-anti-magic; and can determine labeling with the required properties for a given graph(ILO-4: PI-1, PI-2, PI-3: ILO-5: PI-1, PI-2, PI-3, PI-4).	5		20		
Total		20	20	30	30	100

[illegible]

