SEMESTER LEARNING PLAN

DISCRETE MATHEMATICS COURSES
(23H01110503)

TEACHING TEAM

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STUDI PROGRAM OF MATHEMATICS - S1
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
HASANUDDIN UNIVERSITY
MAKASSAR
2025

STUDY PROGRAM OF MATEMATIKA - S1
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
HASANUDDIN UNIVERSITY

Vision

The scientific vision is to become a study program with an international reputation in the development of mathematics based on the Indonesian maritime continent by 2030

Vision Strategy

Misson

To fulfill the above vision, the Undergraduate Mathematics Study Program has four missions, namely:

- Organizing innovative and effective mathematics learning to improve the quality and creativity of students in order to compete nationally and internationally.
- Improving a research culture that produces internationally reputable publications.
- Playing an active role in community service activities and collaborating with other academic institutions, government, business, media and society.
- Carry out governance in the Mathematics Study Program that is effective, efficient and transparent based on IT and ISO 9001:2015 standards to achieve the tridharma goals.

Graduate Profiles

Gagal diterjemahkan

PLO charged to courses

CPL-1 (ILO 1) - Students are able to demonstrate an advanced understanding of basic pure and simple applied mathematics.

CPL-2 (P2) - The students are able to identify objects, techniques, and theorems in fundamental mathematics, and making a connection for solving problems

CPL-3 (KU1) - The students are able to analyse a mathematical problem with logic, analytic, and systematic structure

Course Learning Outcomes (CLO)

CPMK-1: Students have a relatively deep understanding of the basics of counting, enumeration, and an introduction to graph theory (CPL1)

CPMK-2: Students are able to identify objects, basic techniques and theorems for counting, enumeration, and an introduction to graph theory andmake connections to solve problems (CPL2)

CPMK-3: Students are able to analyze discrete mathematics problems logically, analytically and systematically structured (CPL3)

Sub-CLO

Sub CPMK-1: Students master the basic concepts of addition rules, multiplication rules, inclusion-exclusion principles, and division rules. (CPMK-1 dan CPMK-2)

Sub CPMK-2: Students are able to use the pigeon nest principle (CPMK-2 dan CPMK-3)

Sub CPMK-3: Students are able to identify problems into permutation problems or combination problems (CPMK-1, CPMK-2 dan CPMK-3)

Sub CPMK-4: Students are able to understand the concept of recurrence relations in the form of series. (CPMK-1)

Sub CPMK-5: Students are able to understand the concept of generating functions and use them in solving problems related to recurrence relations. (CPMK-2 dan CPMK-3)

Sub CPMK-6: Students can understand the basic concepts of graphs, terminology, types of simple graphs, subgraphs, graph representation in matrix form, and graph isomorphism. (CPMK-1, CPMK-2 dan CPMK-3)

Learning Analytics

Discrete Mathematics

↑

Students can understand the basic concepts of graphs, terminology, types of simple graphs, subgraphs, graph representation in matrix form, and graph isomorphism. (CPMK-1, CPMK-2 dan CPMK-3)

↑

Students are able to understand the concept of generating functions and use them in solving problems related to recurrence relations. (CPMK-2 dan CPMK-3)

↑

Students are able to understand the concept of recurrence relations in the form of series. (CPMK-1)

↑

Students are able to identify problems into permutation problems or combination problems (CPMK-1, CPMK-2 dan CPMK-3)

↑

Students are able to use the pigeon nest principle (CPMK-2 dan CPMK-3)

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Students master the basic concepts of addition rules, multiplication rules, inclusion-exclusion principles, and division rules. (CPMK-1 dan CPMK-2)

Have passed the course Basic Mathematics I and Mathematical Logic and Sets

HASANUDDIN UNIVERSITY
FAKULTY OF MATHEMATICS AND NATURAL SCIENCES
STUDY PROGRAM OF MATHEMATICS - S1
SEMESTER LEARNING PLAN

Course	Code	Cource Group	Credits	SEMESTER	Compilation Date
Discrete Mathematics	23H01110503	Combinatorics	3	2	7 Februari 2025

AUTHORITY	SLP Developer Lecturer	Coordinator	Head of Study Program
	Prof. Dr. Hasmawati, M.Si., Prof. Dr. Nurdin, S.Si., M.Si.	Prof. Dr. Nurdin, S.Si., M.Si.	Dr. Firman, S.Si.,M.Si.

Learning Outcomes Course	**SLOs that are imposed on the course**	
	SLO-1:	Mahasiwa memiliki pemahaman yang relatif mendalam dalam matematika murni dan matematika terapan sederhana.
	SLO-2:	Mahasiswa mampu mengidentifikasi objek, teknik, dan sifat dalam matematika dasar, dan membuat koneksi untuk menyelesaikan masalah
	SLO-3:	Mahasiswa mampu menganalisis suatu masalah matematika dengan logika, analitik, dan struktur sistematis
	SLO ⇒ Course Learning Outcomes	
	After completing this course, it is expected:	
	SLO-1	**CLO-1:** Students have a relatively deep understanding of the basics of counting, enumeration, and an introduction to graph theory
	SLO-2	**CLO-2:** Students are able to identify objects, basic techniques and theorems for counting, enumeration, and an introduction to graph theory andmake connections to solve problems
	SLO-3	**CLO-3:** Students are able to analyze discrete mathematics problems logically, analytically and systematically structured
	CLO ⇒ Sub-CLO	
	CLO-1	**Sub-CLO-1:**Students master the basic concepts of addition rules, multiplication rules, inclusion-exclusion principles, and division rules.
		Sub-CLO-3: Students are able to identify problems into permutation problems or combination problems
		Sub-CLO-4: Students are able to understand the concept of recurrence relations in the form of series.
		Sub-CLO-6: Students can understand the basic concepts of graphs, terminology, types of simple graphs, subgraphs, graph representation in matrix form, and graph isomorphism.
	CLO-2	**Sub-CLO-1:**Students master the basic concepts of addition rules, multiplication rules, inclusion-exclusion principles, and division rules.
		Sub-CLO-2: Students are able to use the pigeon nest principle
		Sub-CLO-3: Students are able to identify problems into permutation problems or combination problems

		Sub-CLO-5: Students are able to understand the concept of generating functions and use them in solving problems related to recurrence relations.
		Sub-CLO-6: Students can understand the basic concepts of graphs, terminology, types of simple graphs, subgraphs, graph representation in matrix form, and graph isomorphism.
	CLO-3	**Sub-CLO-2:**Students are able to use the pigeon nest principle
		Sub-CLO-3: Students are able to identify problems into permutation problems or combination problems
		Sub-CLO-5: Students are able to understand the concept of generating functions and use them in solving problems related to recurrence relations.
		Sub-CLO-6: Students can understand the basic concepts of graphs, terminology, types of simple graphs, subgraphs, graph representation in matrix form, and graph isomorphism.
	Correlation between SLOs/CLOs to Sub-CLOs	

SLOs that are charged on the Course	**CPMK**	**SUB CPMK**	**Form of Assessment***						**Weight**	**Value**	**Student Score**
			Formative	**Sumative**							
				Quiz	**Project Based**	**Written Exam**	**Case Studies**	**Project Report**			
SLO-2	CLO-2	SUB-CLO-1		15	0	0	0	0	15		
SLO-3	CLO-3	SUB-CLO-2		0	15	0	0	0	15		
SLO-3	CLO-3	SUB-CLO-3		0	0	20	0	0	20		
SLO-1	CLO-1	SUB-CLO-4		0	0	0	5	0	5		
SLO-3	CLO-3	SUB-CLO-5		10	0	0	0	0	10		
SLO-3	CLO-3	SUB-CLO-6		0	0	0	0	35	35		
				25	15	20	5	35	100		

Course Description	This course provides and discusses several basic and important concepts in discrete mathematics. This course also provides students with the opportunity to practice creative thinking in solving discrete problems. With reference to the targets above, this course is given with an emphasis on giving students relatively a lot of time to do problem-solving ranging from simple problems to quite complex ones. Although the presentation of this course does not have to be proof-like, one or two theorems need to be presented and proven in detail to provide examples of verbal argumentation. The material for this course includes: addition rules, multiplication rules, and the dove's nest principle, the inclusion-exclusion principle, relations and types of relations, first-order/second-order linear recurrence relations and their solutions, generating functions, and the basics of graph theory. W5H

Learning Materials/Subjects	1. DFundamentals of Counting 2. Generating Function 3. Recurrence Relationship 4. Introduction to Graph Theory
Reference	**Main References**
	1. Discrete Mathematics and Its Applications Seventh Edition, Kenneth H. Rosen, Published by McGraw-Hill, 2012. 2. Discrete and Combinatorial Mathematics an applied introduction fifth edition, Ralph P. Grimaldi, Pearson Addision Wesley, 2004 3. Discrete Mathematics, W W W Chen, 2003 4. A Short Course in Discrete Mathematics, for students of computer and computational science, Edward A. Bender and S. Gill Williamson, 2004 5. Hasmawati, Graph Theory, 2023
	Additional References
	Gagal diterjemahkan
Teaching Team	Prof. Dr. Hasmawati, M.Si., Prof. Dr. Nurdin, S.Si., M.Si.
Course requirement	Basic Mathematics I, Mathematical Logic and Sets

Week	**Sub CPMK (End-of-stage learning ability)**	**Penilaian (*Assesment*)**		**Learning Forms and Methods [time estimate]**		**Content**	**Weight of Assessment (%)**
		Indicator	**Techniques & Criteria**	**Offline**	**Online**		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

1-3	Students master the basic concepts of addition rules, multiplication rules, inclusion-exclusion principles, and division rules. (CPMK-1, CPMK-2)	**Formative:** Gagal diterjemahkan **Sumative:** Students can determine the number of occurrences of an event related to sequential events and events that use the pigeon's nest principle	**Formative Criteria:** **Sumative Criteria:** Quiz (15) dinilai dengan rubrik 01 **Assessment Technique:** Gagal diterjemahkan	**Studying:** Discovery Learning - 2 x 150 minutes		College Contract, Addition rule, multiplication rule, inclusion-exclusion principle, and division principle	15
4-5	Students are able to use the pigeon nest principle (CPMK-2, CPMK-3)	**Formative:** Gagal diterjemahkan **Sumative:** Students can calculate the number of intersection members of four sets	**Formative Criteria:** **Sumative Criteria:** Project Based (15) dinilai dengan rubrik 01 **Assessment Technique:** Gagal diterjemahkan	**Studying:** Self-Directed Learning The last 10 minutes of the quiz were held 150 minutes		Principles of pigeon nests and their applications	15
6-8	Students are able to identify problems into permutation problems or combination problems (CPMK-1, CPMK-2, CPMK-3)	**Formative:** Gagal diterjemahkan **Sumative:** Students can use the concept of permutation in various problems and can use the concept of combination in determining the coefficient of a variable of a certain rank in a binomial expansion	**Formative Criteria:** **Sumative Criteria:** Written Exam (20) dinilai dengan rubrik 01 **Assessment Technique:** Gagal diterjemahkan	**Studying:** Self-Directed Learning, Case Study The 4th meeting discussed permutations and combinations. The 5th meeting discussed repeated combinations The 6th meeting resolved cases 3 x 150 minutes		Permutation, combination, Binomial Theorem, Combination dg. Repetition	20

9-10	Students are able to understand the concept of recurrence relations in the form of series. (CPMK-1)	**Formative:** Gagal diterjemahkan **Sumative:** Students are able to determine solutions to recurrence relations	**Formative Criteria:** **Sumative Criteria:** Case Studies (5) dinilai dengan rubrik 01 **Assessment Technique:** Gagal diterjemahkan	**Other Forms:** Case Study (Case Study) 2 x 150 minutes		Recurrence relationship	5
11-12	Students are able to understand the concept of generating functions and use them in solving problems related to recurrence relations. (CPMK-2, CPMK-3)	**Formative:** Gagal diterjemahkan **Sumative:** Students can use generator functions to find solutions to recurrence relations	**Formative Criteria:** **Sumative Criteria:** Quiz (10) dinilai dengan rubrik 01 **Assessment Technique:** Gagal diterjemahkan	**Other Forms:** Case Study (Case Study) - 150 minutes		Generator functions and applications	10
13-16	Students can understand the basic concepts of graphs, terminology, types of simple graphs, subgraphs, graph representation in matrix form, and graph isomorphism. (CPMK-1, CPMK-2, CPMK-3)	**Formative:** Gagal diterjemahkan **Sumative:** Students can explain basic graph concepts, terminology, types of simple graphs, subgraphs, graph representation in matrix form, and graph isomorphism.	**Formative Criteria:** **Sumative Criteria:** Project Report (35) dinilai dengan rubrik 01 **Assessment Technique:** Gagal diterjemahkan	**Other Forms:** Case Study (Case Study) - 2 x 150 minutes		Definition and terminology of graphs as well as matrices and graph isomorphism	35
							100

Matrix of SLO, CLO, and Assessment Method

SLO / CLO	CLO-1	CLO-2	CLO-3
CPL-1 (ILO 1)	Quiz (Weight 15%) Written Exam (Weight 20%) Case Studies (Weight 5%) Project Report (Weight 35%)		
CPL-2 (P2)		Quiz (Weight 15%) Project Based (Weight 15%) Written Exam (Weight 20%) Quiz (Weight 10%) Project Report (Weight 35%)	
CPL-3 (KU1)			Project Based (Weight 15%) Written Exam (Weight 20%) Quiz (Weight 10%) Project Report (Weight 35%)

Evaluation Type and Assessment Weight

Type	Assessment Weight
Quiz	25
Project Based	15
Written Exam	20
Case Studies	5
Project Report	35
Total	100

Assessment and Evaluation of Student Achievement of CLOs

SLOs that are charged on the Course	CLO	SUB CLO	Form of Assessment*						Weight	Value	Student Score
			Formative	Sumative							
				Quiz	Project Based	Written Exam	Case Studies	Project Report			
SLO-2	CLO-2	SUB-CLO-1		15	0	0	0	0	15		
SLO-3	CLO-3	SUB-CLO-2		0	15	0	0	0	15		
SLO-3	CLO-3	SUB-CLO-3		0	0	20	0	0	20		
SLO-1	CLO-1	SUB-CLO-4		0	0	0	5	0	5		
SLO-3	CLO-3	SUB-CLO-5		10	0	0	0	0	10		
SLO-3	CLO-3	SUB-CLO-6		0	0	0	0	35	35		
				25	15	20	5	35	100		

Lampiran Rubrik 01 | ASSESMENT TERTULIS

Kriteria Penilaian	Bobot/Skor Penilaian				
	5	4	3	2	1/0
Konsep/ metode yang digunakan	Penjelasan konsep /metode (*) sangat lengkap dan akurat	Penjelasan konsep/metode (*) cukup jelas tetapi beberapa informasi tidak dituliskan secara lengkap.	Penjelasan konsep/metode (*) kurang jelas dan banyak informasi yang tidak dituliskan	Penjelasan yang dituliskan hampir tidak berkaitan dengan konsep/ metode (*)	Tidak memberikan konsep yang dibutuhkan
Sistematika penulisan/ pembuktian	Sistematika penulisan/ pembuktian sangat jelas dan terstruktur	Sistematika penulisan/ pembuktian cukup jelas namun ada langkah yang hilang	Sistematika penulisan/ pembuktian kurang jelas	Sistematika penulisan/ pembuktian tidak jelas	Jawaban tidak benar/ tidak ada
Interpretasi geometri/ kualitatif/ kuantitatif.	Interpretasi geometri/ kualitatif/ kuantitaBtif (*) tepat dan lengkap	Interpretasi geometri/ kualitatif/ kuantitatif (*) cukup lengkap/ tepat	Interpretasi geometri/ kualitatif/ kuantitatif (*) kurang lengkap/ tepat	Interpretasi geometri/ kualitatif/ kuantitatif(*) tidak lengkap/ tepat	Interpretasi geometri/ kualitatif/kuantitatif(*) tidak benar
Perhitungan/kesimpulan	Perhitungan/ kesimpulan sangat akurat/tepat dan disertai alasan yang mendasarinya	Perhitungan/ kesimpulan cukup akurat/tepat dan disertai alasan yang mendasarinya	Kesimpulan cukup tepat, namun tidak disertai alasan yang jelas	Perhitungan/ kesimpulan kurang akurat/tepat dan tidak disertai alasan yang mendasarinya	Perhitungan/kesimpulan salah