SEMESTER LEARNING PLAN

OPERATIONS RESEARCH COURSES
(23H01121103)

TEACHING TEAM

Prof. Dr. Aidawayati Rangkuti, MS.
195707051985032001

Prof. Agustinus Ribal, S.Si.,M.Sc., Ph. D
197508161999031001

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

CPL-4 (KU2) - The students are able to use their sufficiently mathematical critical thinking for abstraction and generalization of a mathematical problem

CPL-6 (KK2) - The students are able to apply the mathematical method for solving a mathematical related-problem with or without the aid of computers and software

CPL-7 (KK3) - The students are able to demonstrate mathematical skills which include interpretation, connecting problems, solving problems, and communicating individually or teamwork

Course Learning Outcomes (CLO)

CPMK-1: Students can understand several mathematical methods and concepts and apply these methods in several other related fields such as industry, economics and agriculture. (CPL4)

CPMK-2: Students can analyze and implement several models in operations research into other fields of study (CPL3, CPL4 dan CPL6)

CPMK-3: Students can construct several mathematical models, explain procedures, and solve linear programming problems using appropriate optimization techniques and solutions and interpret the results obtained in other related fields. (CPL3, CPL4, CPL6 dan CPL7)

CPMK-4: Students are able to communicate ideas, develop their abilities based on local wisdom and easily adapt to communities with different backgrounds (CPL3, CPL4 dan CPL7)

Sub-CLO

Sub CPMK-1: Understand well the objectives, uses of lecture material, and its relationship to other courses (CPMK-1)

Sub CPMK-2: Students are able to solve linear programming problems using graphic methods and analyze

the solution for decision making (CPMK-1 dan CPMK-2)

Sub CPMK-3: Students are able to analyze and solve Linear Program problems using the simplex method, for minimum and maximum problems and carry out sensitivity analysis. Compare the results obtained with the optimal results of the LINDO program (CPMK-2, CPMK-3 dan CPMK-4)

Sub CPMK-4: Students are able to solve linear programming problems using the two-phase method. Students are able to determine the dual of the primal problem and solve it using the simplex method (CPMK-1, CPMK-2 dan CPMK-4)

Sub CPMK-5: Understand well the purpose and use of transportation models. Students are able to solve transportation problems using the northwest corner method and the Vogel method (CPMK-1 dan CPMK-2)

Sub CPMK-6: Students are able to determine the optimal solution to transportation problems using the Stepping Stone and MODI methods, and are able to make decisions from the analysis (CPMK-2 dan CPMK-4)

Sub CPMK-7: Students have insight into creating network projects with the longest and shortest paths. Students are able to create a flow diagram of a project with the longest and shortest paths, and make accurate decisions (CPMK-1, CPMK-2 dan CPMK-4)

Learning Analytics

Operations Research

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Students have insight into creating network projects with the longest and shortest paths. Students are able to create a flow diagram of a project with the longest and shortest paths, and make accurate decisions (CPMK-1, CPMK-2 dan CPMK-4)

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Students are able to determine the optimal solution to transportation problems using the Stepping Stone and MODI methods, and are able to make decisions from the analysis (CPMK-2 dan CPMK-4)

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Understand well the purpose and use of transportation models. Students are able to solve transportation problems using the northwest corner method and the Vogel method (CPMK-1 dan CPMK-2)

↑

Students are able to solve linear programming problems using the two-phase method. Students are able to determine the dual of the primal problem and solve it using the simplex method (CPMK-1, CPMK-2 dan CPMK-4)

↑

Students are able to analyze and solve Linear Program problems using the simplex method, for minimum and maximum problems and carry out sensitivity analysis. Compare the results obtained with the optimal results of the LINDO program (CPMK-2, CPMK-3 dan CPMK-4)

↑

Students are able to solve linear programming problems using graphic methods and analyze the solution for decision making (CPMK-1 dan CPMK-2)

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Understand well the objectives, uses of lecture material, and its relationship to other courses (CPMK-1)

Have passed the course Basic Mathematics II and Linear Algebra I

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

Course	Code	Cource Group	Credits	SEMESTER	Compilation Date
Operations Research	23H01121103		3	4	10 Agustus 2024

AUTHORITY	SLP Developer Lecturer	Coordinator	Head of Study Program
	Prof. Dr. Aidawayati Rangkuti, MS., Prof. Agustinus Ribal, S.Si.,M.Sc., Ph. D	Prof. Dr. Aidawayati Rangkuti, MS.	Dr. Firman, S.Si.,M.Si.

SLOs that are imposed on the course	
SLO-3:	Mahasiswa mampu menganalisis suatu masalah matematika dengan logika, analitik, dan struktur sistematis
SLO-4:	Mahasiswa dapat menggunakan pemikiran kritis matematis mereka yang cukup untuk abstraksi dan generalisasi masalah matematika berdasarkan hasil analisis informasi dan data
SLO-6:	Mahasiswa dapat menerapkan metode matematika untuk memecahkan masalah terkait matematika dengan atau tanpa bantuan komputer dan perangkat lunak
SLO-7:	Mahasiswa dapat menunjukkan keterampilan matematika termasuk menghubungkan masalah, menyelesaikan masalah, interpretasi, dan berkomunikasi secara individu atau dengan kerja tim

SLO ⇒ Course Learning Outcomes	
After completing this course, it is expected:	
SLO-4	**CLO-1:** Students can understand several mathematical methods and concepts and apply these methods in several other related fields such as industry, economics and agriculture.
	CLO-2: Students can analyze and implement several models in operations research into other fields of study
	CLO-3: Students can construct several mathematical models, explain procedures, and solve linear programming problems using appropriate optimization techniques and solutions and interpret the results obtained in other related fields.
	CLO-4: Students are able to communicate ideas, develop their abilities based on local wisdom and easily adapt to communities with different backgrounds
SLO-3	**CLO-2:** Students can analyze and implement several models in operations research into other fields of study
	CLO-3: Students can construct several mathematical models, explain procedures, and solve linear programming problems using appropriate optimization techniques and solutions and interpret the results obtained in other related fields.
	CLO-4: Students are able to communicate ideas, develop their abilities based on local wisdom and easily adapt to communities with different backgrounds
	CLO-2: Students can analyze and implement several models in operations research into other fields of study

Learning Outcomes Course	**SLO-6**	
		CLO-3: Students can construct several mathematical models, explain procedures, and solve linear programming problems using appropriate optimization techniques and solutions and interpret the results obtained in other related fields.
	SLO-7	**CLO-3:** Students can construct several mathematical models, explain procedures, and solve linear programming problems using appropriate optimization techniques and solutions and interpret the results obtained in other related fields.
		CLO-4: Students are able to communicate ideas, develop their abilities based on local wisdom and easily adapt to communities with different backgrounds
	CLO ⇒ Sub-CLO	
	CLO-1	**Sub-CLO-1:**Understand well the objectives, uses of lecture material, and its relationship to other courses
		Sub-CLO-2: Students are able to solve linear programming problems using graphic methods and analyze the solution for decision making
		Sub-CLO-4: Students are able to solve linear programming problems using the two-phase method. Students are able to determine the dual of the primal problem and solve it using the simplex method
		Sub-CLO-5: Understand well the purpose and use of transportation models. Students are able to solve transportation problems using the northwest corner method and the Vogel method
		Sub-CLO-7: Students have insight into creating network projects with the longest and shortest paths. Students are able to create a flow diagram of a project with the longest and shortest paths, and make accurate decisions
	CLO-2	**Sub-CLO-2:**Students are able to solve linear programming problems using graphic methods and analyze the solution for decision making
		Sub-CLO-3: Students are able to analyze and solve Linear Program problems using the simplex method, for minimum and maximum problems and carry out sensitivity analysis. Compare the results obtained with the optimal results of the LINDO program
		Sub-CLO-4: Students are able to solve linear programming problems using the two-phase method. Students are able to determine the dual of the primal problem and solve it using the simplex method
		Sub-CLO-5: Understand well the purpose and use of transportation models. Students are able to solve transportation problems using the northwest corner method and the Vogel method
		Sub-CLO-6: Students are able to determine the optimal solution to transportation problems using the Stepping Stone and MODI methods, and are able to make decisions from the analysis
		Sub-CLO-7: Students have insight into creating network projects with the longest and shortest paths. Students are able to create a flow diagram of a project with the longest and shortest paths, and make accurate decisions
	CLO-3	**Sub-CLO-3:**Students are able to analyze and solve Linear Program problems using the simplex method, for minimum and maximum problems and carry out sensitivity analysis. Compare the results obtained with the optimal results of the LINDO program
	CLO-4	**Sub-CLO-3:**Students are able to analyze and solve Linear Program problems using the simplex method, for minimum and maximum problems and carry out sensitivity analysis. Compare the results obtained with the optimal results of the LINDO program
		Sub-CLO-4: Students are able to solve linear programming problems using the two-phase method. Students are able to determine the dual of the primal problem and solve it using the simplex method
		Sub-CLO-6: Students are able to determine the optimal solution to transportation problems using the Stepping Stone and MODI methods, and are able to make decisions from the analysis

	Sub-CLO-7: Students have insight into creating network projects with the longest and shortest paths. Students are able to create a flow diagram of a project with the longest and shortest paths, and make accurate decisions

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						
				Short Q&A	Independent Assignment	Case Studies	Written Exam	Written Exam			
SLO-4	CLO-1	SUB-CLO-1	discipline, perseverance, activeness	5	0	0	0	0	5		
SLO-6	CLO-2	SUB-CLO-2	fill in the correct answer	0	10	0	2.86	0	12.86		
SLO-7	CLO-4	SUB-CLO-3	discipline, perseverance, activeness	0	0	10	2.86	0	12.86		
SLO-7	CLO-4	SUB-CLO-4	discipline, perseverance, activeness	0	0	15	4.29	0	19.29		
SLO-6	CLO-2	SUB-CLO-5	discipline, perseverance, activeness	0	0	15	0	3.75	18.75		
SLO-7	CLO-4	SUB-CLO-6	discipline, perseverance, activeness	0	10	0	0	2.5	12.5		
SLO-7	CLO-4	SUB-CLO-7	discipline, perseverance, activeness	0	0	15	0	3.75	18.75		
				5	20	55	10	10	100		

Course Description	The Operations Research course is one of the mandatory courses in the Mathematics study program which will give students the ability to formulate linear programming problems and solve these problems using optimization methods either manually or using software. Next, look for duals of linear programming problems and their properties and carry out sensitivity analysis. In the second part of this course we will discuss transportation problems and solve these problems using the Vogel's approximation method (VAM), the stepping stone method and the MODI (Modified distribution) method. In the final part of this course, we will discuss work network issues and solve work network problems.

Learning Materials/Subjects	1. Convex set and formulation of Linear Programming problems 2. Solving linear programming problems using graphical methods (Graphical method for solving linear programming problems) 3. Solving linear programming problems using the simplex method (Simplex method for solving linear programming problems) 4. Types of linear programming problem solutions (Special cases of the linear programming solution) 5. Duality and its properties 6. Formulation of transportation problems and the VAM method (Formulation of linear programming problems and Vogel's approximation method) 7. Stepping stone method and MODI (Stepping stone method and Modified distribution) 8. Project management 9. PERT (Program evaluation and review technique)
Reference	**Main References**
	1. Frederick, S. H, Gerald, 2001.” Introduction to Operations Research”. seven edition, Mc Graw-Hill, New York. 2. Gass, Saul L, 1984. "Linear Programming: Method and Application". Fifth edition, Mc Graw-Hill, New York 3. Ronald. E. Miller, 2000. “Optimization” Foundation and Application. Prentice Hall, Inc USA 4. Hiller, Liebermen. 2005. Introduction to Operations Research. Eighth edition, Mc Graw-Hill, Companies, one book, New York.
	Additional References
	Taha, Hamdy, 2007. "Operation Research". Eighth edition Mc Graw- Hill, New York
Teaching Team	Prof. Dr. Aidawayati Rangkuti, MS., Prof. Agustinus Ribal, S.Si.,M.Sc., Ph. D
Course requirement	Basic Mathematics II, Linear Algebra I

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	Understand well the objectives, uses of lecture material, and its relationship to other courses (CPMK-1)	**Formative:** discipline, perseverance, activeness **Sumative:** Accuracy in explaining the semester learning plan well.	**Formative Criteria:** discipline, perseverance, activeness dinilai dengan rubrik 04 **Sumative Criteria:** Short Q&A (5) dinilai dengan rubrik 04 **Assessment Technique:** Non Test	**Studying:** Other methods 1X3X50		Lecture Contract: Lecture contract (objectives, scope, materials, learning uses and relation to other courses) on Linear programming (PL), Net work Planning, and Transportation.	5
2-3	Students are able to solve linear programming problems using graphic methods and analyze the solution for decision making (CPMK-1, CPMK-2)	**Formative:** accuracy of understanding **Sumative:** Ability to apply graphical methods in solving linear programming problems and pay attention to the possibility of other solutions.	**Formative Criteria:** fill in the correct answer dinilai dengan rubrik 01 **Sumative Criteria:** Independent Assignment (10) dinilai dengan rubrik 01 **Assessment Technique:** Test and Non-Test	**Studying:** Group discussion (Small Group Discussion) 2X3X50		Formulating linear programming problems, solving linear programming problems using graphical methods and analyzing the possibility of other solutions to the linear programming problem.	10

4-5	Students are able to analyze and solve Linear Program problems using the simplex method, for minimum and maximum problems and carry out sensitivity analysis. Compare the results obtained with the optimal results of the LINDO program (CPMK-2, CPMK-3, CPMK-4)	**Formative:** accuracy of understanding **Sumative:** Ability to apply the simplex method with high accuracy and analyze the influence of changes in sources	**Formative Criteria:** discipline, perseverance, activeness dinilai dengan rubrik 01 **Sumative Criteria:** Case Studies (10) dinilai dengan rubrik 01 **Assessment Technique:** Gagal diterjemahkan	**Studying:** Group discussions (Small Group Discussion), Collaborative Learning (Collaborative Learning) 2X3X50		Simplex method for maximum and minimum problems. Determine the types of solutions to linear programming problems. Sensitivity analysis and solution using the simplex method and using the LINDO program.	10
6-7	Students are able to solve linear programming problems using the two-phase method. Students are able to determine the dual of the primal problem and solve it using the simplex method (CPMK-1, CPMK-2, CPMK-4)	**Formative:** accuracy of understanding **Sumative:** Ability to apply the two-phase method and be able to analyze the relationship between solutions to dual linear programming problems.	**Formative Criteria:** discipline, perseverance, activeness dinilai dengan rubrik 04 **Sumative Criteria:** Case Studies (15) dinilai dengan rubrik 04 **Assessment Technique:** Test and Non-Test	**Studying:** Collaborative learning (Collaborative Learning) 2X3X50		Two-phase method and the Primal – Dual problem.	15
8	WRITTEN EXAMINATION						10

9-10	Understand well the purpose and use of transportation models. Students are able to solve transportation problems using the northwest corner method and the Vogel method (CPMK-1, CPMK-2)	**Formative:** accuracy of understanding **Sumative:** Ability to apply the northwest corner and Vogel methods to transportation problems correctly.	**Formative Criteria:** discipline, perseverance, activeness dinilai dengan rubrik 04 **Sumative Criteria:** Case Studies (15) dinilai dengan rubrik 01 **Assessment Technique:** Gagal diterjemahkan	**Studying:** Collaborative learning (Collaborative Learning), other methods 3X3X50		Definition, assumptions of the Transportation Problem. Application of Northwset corner rule and Vogel's method	15
11-12	Students are able to determine the optimal solution to transportation problems using the Stepping Stone and MODI methods, and are able to make decisions from the analysis (CPMK-2, CPMK-4)	**Formative:** accuracy of understanding **Sumative:** Ability to apply stepping stone and MODI methods with right.	**Formative Criteria:** discipline, perseverance, activeness dinilai dengan rubrik 01 **Sumative Criteria:** Independent Assignment (10) dinilai dengan rubrik 01 **Assessment Technique:** Gagal diterjemahkan	**Studying:** Group discussion (Small Group Discussion), other methods 2X3X50		Stepping Stone Method and MODI Method	10

13-15	Students have insight into creating network projects with the longest and shortest paths. Students are able to create a flow diagram of a project with the longest and shortest paths, and make accurate decisions (CPMK-1, CPMK-2, CPMK-4)	**Formative:** accuracy of understanding **Sumative:** Students are able to analyze and determine the shortest path according to the project budget and determine the opportunity for a project to be completed within a certain time.	**Formative Criteria:** discipline, perseverance, activeness dinilai dengan rubrik 01 **Sumative Criteria:** Case Studies (15) dinilai dengan rubrik 01 **Assessment Technique:** Gagal diterjemahkan	**Studying:** Group discussions (Small Group Discussion), Collaborative Learning (Collaborative Learning) 3X3X50		Project management which includes the shortest path problem, determining the critical path, calculating the critical path and flow problems with minimum costs. Determining opportunities and costs in the project schedule. PERT- CPM	15
16	WRITTEN EXAMINATION						10
							100

Matrix of SLO, CLO, and Assessment Method

SLO / CLO	CLO-1	CLO-2	CLO-3	CLO-4
CPL-3 (KU1)		Independent Assignment (Weight 10%) Case Studies (Weight 10%) Case Studies (Weight 15%) Case Studies (Weight 15%) Independent Assignment (Weight 10%) Case Studies (Weight 15%)	Case Studies (Weight 10%)	Case Studies (Weight 10%) Case Studies (Weight 15%) Independent Assignment (Weight 10%) Case Studies (Weight 15%)
CPL-4 (KU2)	Short Q&A (Weight 5%) Independent Assignment (Weight 10%) Case Studies (Weight 15%) Case Studies (Weight 15%) Case Studies (Weight 15%)	Independent Assignment (Weight 10%) Case Studies (Weight 10%) Case Studies (Weight 15%) Case Studies (Weight 15%) Independent Assignment (Weight 10%) Case Studies (Weight 15%)	Case Studies (Weight 10%)	Case Studies (Weight 10%) Case Studies (Weight 15%) Independent Assignment (Weight 10%) Case Studies (Weight 15%)
CPL-6 (KK2)		Independent Assignment (Weight 10%) Case Studies (Weight 10%) Case Studies (Weight 15%) Case Studies (Weight 15%) Independent Assignment (Weight 10%) Case Studies (Weight 15%)	Case Studies (Weight 10%)	

SLO / CLO	CLO-1	CLO-2	CLO-3	CLO-4
CPL-7 (KK3)			Case Studies (Weight 10%)	Case Studies (Weight 10%) Case Studies (Weight 15%) Independent Assignment (Weight 10%) Case Studies (Weight 15%)

Evaluation Type and Assessment Weight

Type	Assessment Weight
Short Q&A	5
Independent Assignment	20
Case Studies	55
Written Exam	10
Written Exam	10
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						
				Short Q&A	Independent Assignment	Case Studies	Written Exam	Written Exam			
SLO-4	CLO-1	SUB-CLO-1	discipline, perseverance, activeness	5	0	0	0	0	5		
SLO-6	CLO-2	SUB-CLO-2	fill in the correct answer	0	10	0	2.86	0	12.86		
SLO-7	CLO-4	SUB-CLO-3	discipline, perseverance, activeness	0	0	10	2.86	0	12.86		
SLO-7	CLO-4	SUB-CLO-4	discipline, perseverance, activeness	0	0	15	4.29	0	19.29		
SLO-6	CLO-2	SUB-CLO-5	discipline, perseverance, activeness	0	0	15	0	3.75	18.75		
SLO-7	CLO-4	SUB-CLO-6	discipline, perseverance, activeness	0	10	0	0	2.5	12.5		
SLO-7	CLO-4	SUB-CLO-7	discipline, perseverance, activeness	0	0	15	0	3.75	18.75		
				5	20	55	10	10	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

Lampiran Rubrik 04 | ASSESMENT DISKUSI

Kriteria Penilaian	Bobot/Skor Penilaian				
	5	4	3	2	1
Kelugasan argumen	Mahasiswa menyampaikan pendapat menggunakan bahasa yang sangat baik, sangat mudah dimengerti, intonasi suara yang sangat jelas	Mahasiswa menyampaikan pendapat menggunakan bahasa yang baik, mudah dimengerti, intonasi suara yang jelas	Mahasiswa menyampaikan pendapat menggunakan bahasa yang cukup baik, cukup mudah dimengerti, intonasi suara yang cukupjelas	Mahasiswa menyampaikan pendapat menggunakan bahasa yang kurang baik, kurang mudah dimengerti, intonasi suara yang kurangjelas	Mahasiswa menyampaikan pendapat menggunakan bahasa yang tidak baik, tidak mudah dimengerti, intonasi suara yang tidakjelas
Parsitipasi aktif	Mahasiswa sangat aktif menyampaikan pendapat/masukannya, sangat aktif memberi jawaban, dan sangat berinsiatif mencari solusi	Mahasiswa aktif menyampaikan pendapat/masukannya, aktif memberi jawaban, dan berinsiatif mencari solusi	Mahasiswa cukup aktif menyampaikan pendapat/masukannya, cukup aktif memberi jawaban, dan cukupberinsiatif mencari solusi	Mahasiswa kurang aktif menyampaikan pendapat/masukannya, kurang aktif memberi jawaban, dan kurangberinsiatif mencari solusi	Mahasiswa tidak aktif menyampaikan pendapat/masukannya, tidakaktif memberi jawaban, dan tidak berinsiatif mencari solusi
Etika dan sikap tata nilai	Mahasiswa sangat mengindahkan etika diskusi akademik secara umum	Mahasiswa mengindahkan etika diskusi akademik secara umum	Mahasiswa cukup mengindahkan etika diskusi akademik secara umum	Mahasiswa kurang mengindahkan etika diskusi akademik secara umum	Mahasiswa tidakmengindahkan etika diskusi akademik secara umum
Kepemimpinan (diskusi kelompok)	Mahasiswa sangat mampu menginisiasi, menggerakkan, mengarahkan, mengorganisir jalannya diskusi	Mahasiswa mampu menginisiasi, menggerakkan, mengarahkan, mengorganisir jalannya diskusi	Mahasiswa cukup mampu menginisiasi, menggerakkan, mengarahkan, mengorganisir jalannya diskusi	Mahasiswa kurang mampu menginisiasi, menggerakkan, mengarahkan, mengorganisir jalannya diskusi	Mahasiswa tidak mampu menginisiasi, menggerakkan, mengarahkan, mengorganisir jalannya diskusi