

SEMESTER COURSE PLAN

**SEISMOLOGY COURSES
(23H06121103)**



TEACHING TEAM

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

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

Vision

Become a program Reliable studies in the field of geophysics to produce superior graduates and mastering science, technology, arts and culture based on BMI in 2030.

Vision Strategy

Mission

Based on the Vision above, the Geophysics Study Program has a mission:

1. Improving the quality of education to produce graduates who are competitive, able to work independently and in groups in implementing and developing BMI science and technology;
2. Carrying out research to produce reliable and competitive scientific work oriented towards the scientific development of solid geophysics, marine geophysics, geoinformatics and hydro-meteorology;
3. Disseminate the results of applied research, action studies and appropriate technology packages in synergistic and accelerated productive activities to improve the quality of life of the community.

Graduate Profiles

Educators in the Field of Geophysics; meteorologist; geomaths; oceanographer; exploration geophysicist; seismologist ; geophysical entrepreneur.

PLO charged to courses

- CPL-4 (P1) - Mastering theoretical concepts of land, sea and geophysics atmosphere, principles of exploration, and design exploration necessary for identification and mapping natural resources and natural disaster mitigation;
- CPL-8 (KU1) - Able to apply logical, critical, systematic and innovative thinking in developing or applying geophysical science by considering human values, and able to analyze and communicate case studies and research results using geophysical tools through scientific reports, international presentations and article publications, as well as uploading them on the university website.
- CPL-11 (KK1) - Able to apply the principles of mathematics and earth science, as well as the principles of Exploration and Mitigation to solve natural resource exploration and disaster mitigation problems (Exploration natural resources and natural disaster mitigation)

Course Learning Outcomes (CLO)

- CPMK-1: Able to explain the basic concepts of seismology and apply them to other related fields (CPL4)
- CPMK-2: Able to use geophysical principles to communicate with the wider community in conveying natural phenomena related to seismology (CPL8 dan CPL11)

Sub-CLO

- Sub CPMK-1: Students explain the scope, development and importance of seismology (CPMK-1)
- Sub CPMK-2: Students are able to identify the classification of earthquakes and seismic waves in local earthquakes (CPMK-1)
- Sub CPMK-3: Students are able to create and use Wadati diagrams correctly (CPMK-1)
- Sub CPMK-4: Students are able to explain the concept of particle motion (CPMK-1)

Sub CPMK-5: Students are able to explain the concept of apparent velocity (CPMK-1)

Sub CPMK-6: Students are able to determine the hypocenter (CPMK-1)

Sub CPMK-7: Students are able to distinguish types of magnitude (CPMK-1)

Sub CPMK-8: Students are able to explain earthquake energy (CPMK-2)

Sub CPMK-9: Students are able to explain the concept of intensity scale (CPMK-2)

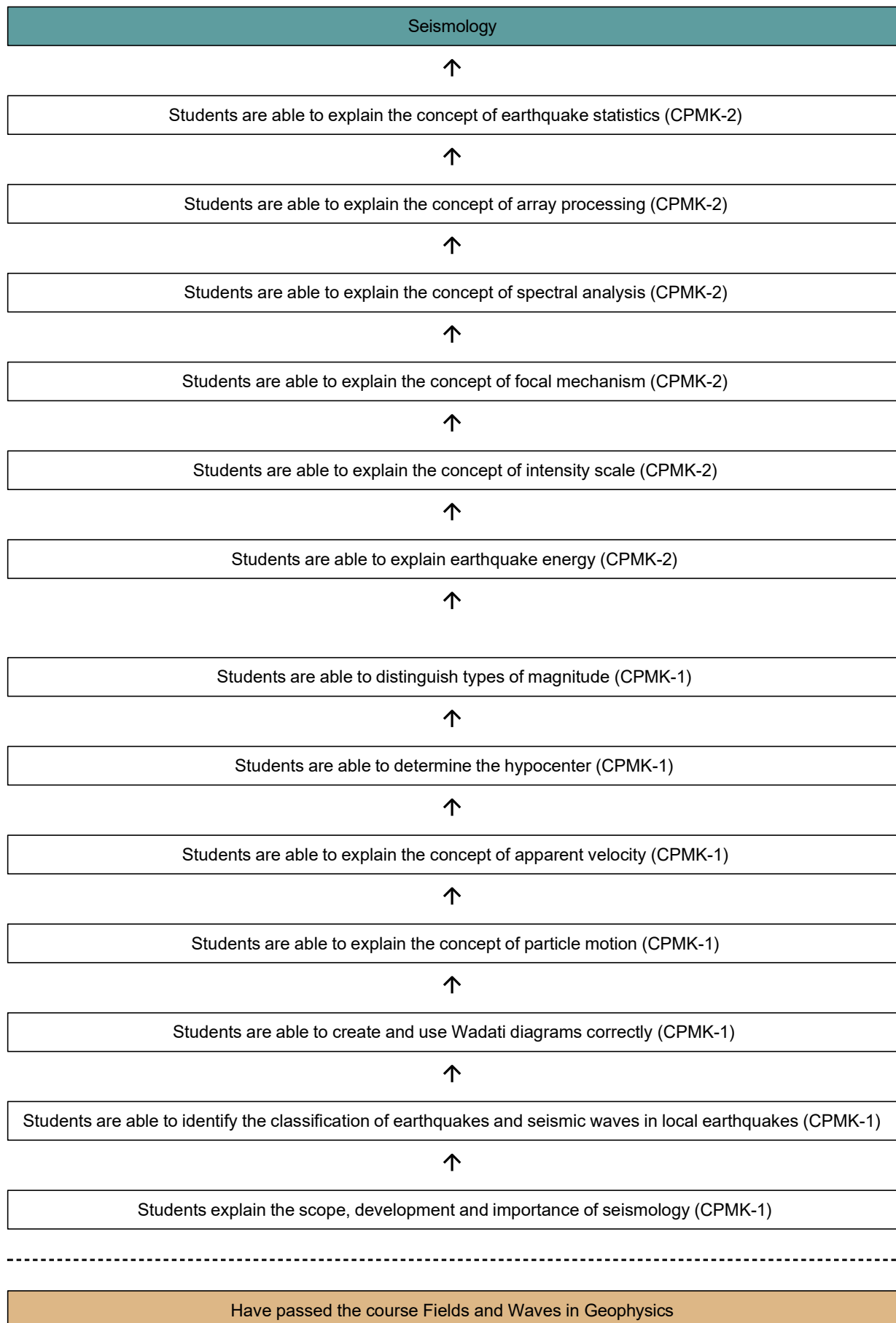
Sub CPMK-10: Students are able to explain the concept of focal mechanism (CPMK-2)

Sub CPMK-11: Students are able to explain the concept of spectral analysis (CPMK-2)

Sub CPMK-12: Students are able to explain the concept of array processing (CPMK-2)

Sub CPMK-13: Students are able to explain the concept of earthquake statistics (CPMK-2)

Learning Analytics





HASANUDDIN UNIVERSITY

FAKULTY OF MATHEMATICS AND NATURAL SCIENCES

STUDY PROGRAM OF GEOPHYSICS - S1

SEMESTER LEARNING PLAN

Course		Code	Course Group	Credits	SEMESTER	Compilation Date
Seismology		23H06121103		3	4	1 Juli 2025
AUTHORITY		SLP Developer Lecturer		Coordinator		Head of Study Program
		Prof. Dr. Ir. Muh. Altin Massinai, MT., Surv.		Prof. Dr. Ir. Muh. Altin Massinai, MT., Surv.		Dr. Muhammad Alimuddin, Eng.
Learning Outcomes Course	SLOs that are imposed on the course					
	SLO-4:	Menguasai konsep teoritis Geofisika darat, laut dan atmosfer, prinsip-prinsip eksplorasi, dan perancangan eksplorasi yang diperlukan untuk identifikasi dan pemetaan SDA serta mitigasi bencana alam;				
	SLO-8:	Mampu menerapkan pemikiran logis, kritis, sistematis, dan inovatif dalam mengembangkan atau menerapkan ilmu geofisika dengan mempertimbangkan nilai-nilai kemanusiaan, serta mampu menganalisis dan mengkomunikasikan studi kasus dan hasil penelitian menggunakan perangkat geofisika melalui laporan ilmiah, presentasi internasional, dan publikasi artikel, serta mengunggahnya pada laman universitas.				
	SLO-11:	Mampu menerapkan prinsip-prinsip matematika dan sains kebumian, serta prinsip Eksplorasi dan Mitigasi untuk menyelesaikan masalah eksplorasi SDA dan mitigasi bencana (Exploration natural resource and natural disaster mitigation)				
	SLO ⇒ Course Learning Outcomes					
	After completing this course, it is expected:					
	SLO-4	CLO-1: Able to explain the basic concepts of seismology and apply them to other related fields				
	SLO-8	CLO-2: Able to use geophysical principles to communicate with the wider community in conveying natural phenomena related to seismology				
	SLO-11	CLO-2: Able to use geophysical principles to communicate with the wider community in conveying natural phenomena related to seismology				
	CLO ⇒ Sub-CLO					
	CLO-1	Sub-CLO-1:Students explain the scope, development and importance of seismology				
		Sub-CLO-2:Students are able to identify the classification of earthquakes and seismic waves in local earthquakes				
		Sub-CLO-3:Students are able to create and use Wadati diagrams correctly				
		Sub-CLO-4:Students are able to explain the concept of particle motion				
		Sub-CLO-5:Students are able to explain the concept of apparent velocity				
		Sub-CLO-6:Students are able to determine the hypocenter				

	CLO-2	Sub-CLO-7: Students are able to distinguish types of magnitude
		Sub-CLO-8: Students are able to explain earthquake energy
		Sub-CLO-9: Students are able to explain the concept of intensity scale
		Sub-CLO-10: Students are able to explain the concept of focal mechanism
		Sub-CLO-11: Students are able to explain the concept of spectral analysis
		Sub-CLO-12: Students are able to explain the concept of array processing
		Sub-CLO-13: Students are able to explain the concept of earthquake statistics
	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				
				Project/Case Study	Summative Test			
SLO-4	CLO-1	SUB-CLO-1	Participation	5	0	5		
SLO-4	CLO-1	SUB-CLO-2	Participation	10	0	10		
SLO-4	CLO-1	SUB-CLO-3	Participation	5	0	5		
SLO-4	CLO-1	SUB-CLO-4	Participation	5	0	5		
SLO-4	CLO-1	SUB-CLO-5	Participation	5	0	5		
SLO-4	CLO-1	SUB-CLO-6	Participation	5	0	5		
SLO-4	CLO-1	SUB-CLO-7	Participation	5	0	5		
SLO-11	CLO-2	SUB-CLO-8	Participation	5	10	15		
SLO-11	CLO-2	SUB-CLO-9	Participation	10	0	10		
SLO-11	CLO-2	SUB-CLO-10	Participation	5	0	5		
SLO-11	CLO-2	SUB-CLO-11	Participation	5	0	5		
SLO-11	CLO-2	SUB-CLO-12	Participation	5	0	5		
SLO-11	CLO-2	SUB-CLO-13	Participation	10	10	20		
				80	20	100		

Course Description		This course is offered in semester III with a weight of 3 credits. This course will discuss the basics of earthquake science from a geophysical perspective. The learning strategies implemented apart from interactive lectures are group presentations, cooperative learning, collaborative learning, demonstrations, case studies and assignments. After completing this course, students are expected to master the basics of earthquake science so that later as graduates of the study program they can further develop it in society as seismologists, academics or as researchers in related fields					
Learning Materials/Subjects		1. Classification of earthquakes and seismic waves in local earthquakes 2. Wadati Diagram 3. Particle Motion 4. Apparent Velocity 5. Hypocenter 6. Magnitude & Intensity 7. Focal mechanism 8. Earthquake statistics					
Reference		Main References					
		1. HuruKawa, N., 2008, Practical Analyzes of Local Earthquakes, (IISSE), Building Research Institute, Tsukuba, JAPAN. 2. Havskov, J. and Ottemöller, L., 2010, Routine Data Processing in Earthquake Seismology, Springer. 3. Afnimar, 2009, seismology, ITB publisher, Bandung.					
		Additional References					
		Seismological Research Letter, Bulletin of the Seismological Society of America and/or other relevant international journals published in the last 5 years					
Teaching Team		Sabrianto Aswad, S.Si., MT, Muhammad Fawzy Ismullah Massinai, S.Si, M.T					
Course requirement		Fields and Waves in Geophysics					
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	Students explain the scope, development and importance of seismology (CPMK-1)	Formative: The accuracy of the application of the concepts of scope, development and significance of seismology. Sumative: -	Formative Criteria: Participation dinilai dengan rubrik 1 Sumative Criteria: Project/Case Study (5) dinilai dengan rubrik 1 Assessment Technique: Non Test	Studying: Cooperative learning (Cooperative learning) 1 x 3 x 50"	Other Forms: Self-Directed Learning • Reading module/ PPT • Watching Videos 1 x 3 x 60" Other Forms: Self-Directed Learning Create a resume and answer practice questions 1 x 3 x 60"	1. Contract College contract 2. A brief history of the development of seismology 3. Seismology and society	5
2	Students are able to identify the classification of earthquakes and seismic waves in local earthquakes (CPMK-1)	Formative: Accuracy in identifying earthquake classification and seismic waves in local earthquakes. Sumative: -	Formative Criteria: Participation dinilai dengan rubrik 1 Sumative Criteria: Project/Case Study (10) dinilai dengan rubrik 1 Assessment Technique: Non Test	Studying: Simulation (Role-Play & Simulation), Project-Based Learning (Project-based Learning) 1 x 3 x 50"	Other Forms: Self-Directed Learning • Reading modules/ PPT • Watching Video 1 x 3 x 60" Other Forms: Self-Directed Learning • Carry out according to the module/PPT/video instructions according to the project given 1 x 3 x 60"	Classification of earthquakes and seismic waves in local earthquakes	10

3	Students are able to create and use Wadati diagrams correctly (CPMK-1)	Formative: Classification of earthquakes and seismic waves in local earthquakesActivity and accuracy in creating and using Wadati Diagrams correctly Sumative: -	Formative Criteria: Participation dinilai dengan rubrik 1 Sumative Criteria: Project/Case Study (5) dinilai dengan rubrik 1 Assessment Technique: Non Test	Studying: Simulation (Role-Play & Simulation), Project-Based Learning (Project-based Learning) 1 x 3 x 50"	Other Forms: Self-Directed Learning • Reading modules/ PPT • Watching Video 1 x 3 x 60" Other Forms: Self-Directed Learning Carry out according to the module/PPT/video instructions according to the project given 1 x 3 x 60"	Wadati Diagram	5
4	Students are able to explain the concept of particle motion (CPMK-1)	Formative: Activeness and accuracy in explaining the concept of particle motion Sumative: -	Formative Criteria: Participation dinilai dengan rubrik 1 Sumative Criteria: Project/Case Study (5) dinilai dengan rubrik 1 Assessment Technique: Non Test	Studying: Cooperative learning (Cooperative learning) 1 x 3 x 50"	Other Forms: Self-Directed Learning • Reading module/ PPT • Watching Videos 1 x 3 x 60" Other Forms: Self-Directed Learning Create a resume and answer the practice questions 1 x 3 x 60"	Particle motion	5

5	Students are able to explain the concept of apparent velocity (CPMK-1)	Formative: Activeness and accuracy in explaining the concept of apparent velocity Sumative: -	Formative Criteria: Participation dinilai dengan rubrik 1 Sumative Criteria: Project/Case Study (5) dinilai dengan rubrik 1 Assessment Technique: Non Test	Studying: Cooperative learning (Cooperative learning) 1 x 3 x 50"	Other Forms: Self-Directed Learning • Reading modules/ PPT • Watching Video 1 x 3 x 60" Other Forms: Self-Directed Learning Create a resume and answer practice questions 1 x 3 x 60"	Apparent velocity	5
6	Students are able to determine the hypocenter (CPMK-1)	Formative: Activeness and accuracy in determining hypocenters Sumative: -	Formative Criteria: Participation dinilai dengan rubrik 1 Sumative Criteria: Project/Case Study (5) dinilai dengan rubrik 1 Assessment Technique: Non Test	Studying: Simulation (Role-Play & Simulation), Project-Based Learning (Project-based Learning) 1 x 3 x 50"	Other Forms: Self-Directed Learning • Reading module/ PPT • Watching Videos 1 x 3 x 50" Other Forms: Self-Directed Learning Carry out according to the module/PPT/video instructions according to the project given 1 x 3 x 60"	Hypocenter determination	5

7	Students are able to distinguish types of magnitude (CPMK-1)	Formative: Activeness and accuracy in distinguishing magnitude types Sumative: -	Formative Criteria: Participation dinilai dengan rubrik 1 Sumative Criteria: Project/Case Study (5) dinilai dengan rubrik 1 Assessment Technique: Non Test	Studying: Cooperative learning (Cooperative learning) 1 x 3 x 50"	Other Forms: Self-Directed Learning • Reading modules/ PPT • Watching Video 1 x 3 x 50" Other Forms: Self-Directed Learning Create a resume and answer practice questions 1 x 3 x 60"	Magnitude	5
8	Students are able to explain earthquake energy (CPMK-2)	Formative: - Sumative: Activeness and accuracy in explaining earthquake energy	Formative Criteria: Participation dinilai dengan rubrik 1 Sumative Criteria: Project/Case Study (5) dinilai dengan rubrik 1 Summative Test (10) dinilai dengan rubrik 1 Assessment Technique: Test and Non-Test	Studying: Cooperative learning (Cooperative learning) 1 x 3 x 50"	Other Forms: Self-Directed Learning • Reading module/ PPT • Watching Videos 1 x 3 x 60" Other Forms: Self-Directed Learning Create a resume and answer practice questions 1 x 3 x 60"	Earthquake energy	15

9	Students are able to explain the concept of intensity scale (CPMK-2)	Formative: Activeness and accuracy in explaining the concept of intensity scale Sumative: -	Formative Criteria: Participation dinilai dengan rubrik 1 Sumative Criteria: Project/Case Study (10) dinilai dengan rubrik 1 Assessment Technique: Non Test	Studying: Group discussion (Small Group Discussion) 1 x 3 x 50"	Other Forms: Self-Directed Learning • Discuss the contents of the module/PPT in the virtual meeting platform 1 x 3 x 60" Other Forms: Self-Directed Learning Create a resume and answer practice questions 1 x 3 x 60"	- Intensity scale - Macroseismic data collection - Iseismal map	10
10	Students are able to explain the concept of focal mechanism (CPMK-2)	Formative: Activity and accuracy in explaining the concept of focal mechanism Sumative: -	Formative Criteria: Participation dinilai dengan rubrik 1 Sumative Criteria: Project/Case Study (5) dinilai dengan rubrik 1 Assessment Technique: Non Test	Studying: Simulation (Role-Play & Simulation), Project-Based Learning (Project-based Learning) 1 x 3 x 50"	Other Forms: Self-Directed Learning • Discuss the contents of the module/PPT in the virtual meeting platform 1 x 3 x 60" Other Forms: Self-Directed Learning Carry out according to the module/PPT/video instructions according to the project given 1 x 3 x 60"	- Focal mechanism - Moment tensor	5

11-12	Students are able to explain the concept of spectral analysis (CPMK-2)	Formative: Activity and accuracy in explaining the concept of spectral analysis Sumative: -	Formative Criteria: Participation dinilai dengan rubrik 1 Sumative Criteria: Project/Case Study (5) dinilai dengan rubrik 1 Assessment Technique: Test and Non-Test	Studying: Group discussion (Small Group Discussion) 2 x 3 x 50"	Other Forms: Self-Directed Learning • Discuss the contents of the module/PPT in the virtual meeting platform 2 x 3 x 60" Other Forms: Self-Directed Learning Create a resume and answer practice questions 2 x 3 x 60"	• Attenuation • Seismic source model • Geometrical spreading • Self-similarity and seismic source spectra • Spectral analysis at local, regional and teleseismic distances • Determination of Q • Soil amplification	5
13	Students are able to explain the concept of array processing (CPMK-2)	Formative: Activeness and accuracy in explaining the concept of array processing Sumative: -	Formative Criteria: Participation dinilai dengan rubrik 1 Sumative Criteria: Project/Case Study (5) dinilai dengan rubrik 1 Assessment Technique: Non Test	Studying: Cooperative learning (Cooperative learning) 1 x 3 x 50"	Other Forms: Self-Directed Learning • Reading modules/ PPT • Watching Video 1 x 3 x 60" Other Forms: Self-Directed Learning Create a resume and answer practice questions 1 x 3 x 60"	• Basic array parameters • Beam forming • Frequency – wavenumber analysis • Array response	5

14-15	Students are able to explain the concept of earthquake statistics (CPMK-2)	Formative: Activeness and accuracy in explaining the concept of earthquake statistics Sumative: -	Formative Criteria: Participation dinilai dengan rubrik 1 Sumative Criteria: Project/Case Study (10) dinilai dengan rubrik 1 Assessment Technique: Non Test	Studying: Group discussion (Small Group Discussion), Simulation (Role-Play & Simulation), Project-based Learning (Project-based Learning) 2 x 3 x 50"	Other Forms: Self-Directed Learning • Discuss the contents of the module/PPT in the virtual meeting platform 2 x 3 x 60" Other Forms: Self-Directed Learning • Carry out according to the module/PPT/video instructions according to the project given 2 x 3 x 60"	Gutenberg – Richter equations	10
16	Students are able to explain the concept of earthquake statistics (CPMK-2)	Formative: - Sumative: Students are able to explain the concept of earthquake statistics	Formative Criteria: Sumative Criteria: Summative Test (10) dinilai dengan rubrik 1 Assessment Technique: Test			-	10
							100

Matrix of SLO, CLO, and Assessment Method

SLO / CLO	CLO-1	CLO-2
CPL-4 (P1)	Project/Case Study (Weight 5%) Project/Case Study (Weight 10%) Project/Case Study (Weight 5%) Project/Case Study (Weight 5%) Project/Case Study (Weight 5%) Project/Case Study (Weight 5%) Project/Case Study (Weight 5%)	
CPL-8 (KU1)		Project/Case Study (Weight 5%) Summative Test (Weight 10%) Project/Case Study (Weight 10%) Project/Case Study (Weight 5%) Project/Case Study (Weight 5%) Project/Case Study (Weight 5%) Project/Case Study (Weight 10%) Summative Test (Weight 10%)

SLO / CLO	CLO-1	CLO-2
CPL-11 (KK1)		Project/Case Study (Weight 5%) Summative Test (Weight 10%) Project/Case Study (Weight 10%) Project/Case Study (Weight 5%) Project/Case Study (Weight 5%) Project/Case Study (Weight 5%) Project/Case Study (Weight 10%) Summative Test (Weight 10%)

Evaluation Type and Assessment Weight

Type	Assessment Weight
Project/Case Study	80
Summative Test	20
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				
				Project/Case Study	Summative Test			
SLO-4	CLO-1	SUB-CLO-1	Participation	5	0	5		
SLO-4	CLO-1	SUB-CLO-2	Participation	10	0	10		
SLO-4	CLO-1	SUB-CLO-3	Participation	5	0	5		
SLO-4	CLO-1	SUB-CLO-4	Participation	5	0	5		
SLO-4	CLO-1	SUB-CLO-5	Participation	5	0	5		
SLO-4	CLO-1	SUB-CLO-6	Participation	5	0	5		
SLO-4	CLO-1	SUB-CLO-7	Participation	5	0	5		
SLO-11	CLO-2	SUB-CLO-8	Participation	5	10	15		
SLO-11	CLO-2	SUB-CLO-9	Participation	10	0	10		
SLO-11	CLO-2	SUB-CLO-10	Participation	5	0	5		
SLO-11	CLO-2	SUB-CLO-11	Participation	5	0	5		
SLO-11	CLO-2	SUB-CLO-12	Participation	5	0	5		
SLO-11	CLO-2	SUB-CLO-13	Participation	10	10	20		
				80	20	100		

Lampiran Rubrik 1 | Rubrik Holistik

Tabel 6. 1 Rubrik Holistik		
Grade Capaian	Skor	Uraian
Sangat Baik	≥ 85	Memperlihatkan pemahaman yang lengkap tentang permasalahan. Semua metode dan persyaratan tentang tugas terdapat dalam jawaban
Baik	71 - 84	Memperlihatkan cukup pemahaman tentang permasalahan. Semua persyaratan tentang tugas terdapat dalam jawaban
Cukup Baik	61 - 70	Memperlihatkan hanya sebagian pemahaman tentang permasalahan. Kebanyakan persyaratan tentang tugas terdapat dalam jawaban
Kurang	51 - 60	Memperlihatkan sedikit pemahaman tentang permasalahan. Banyak persyaratan tugas yang tidak ada
Sangat kurang	< 51	Memperlihatkan tidak ada pemahaman tentang permasalahan