

SEMESTER COURSE PLAN

**GEOHERMAL (P1) COURSES
(23H06131403)**



TEACHING TEAM

Ir. Bambang Hari Mei Soeprapto, M.Si.
196105011990031003

Syamsuddin, S.Si., MT.
197401152002121001

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-12 (KK2) - Able to discover new natural resources through a process of exploration, analysis, interpretation of data and information based on environmentally friendly exploration geophysical principles

Course Learning Outcomes (CLO)

CPMK-1: Students are able to explain geochemistry and its relationship with aspects of earth science and exploration (CPL4)

CPMK-2: Students are able to explain geothermal potential in Indonesia and the geothermal exploration process, especially geophysical exploration (CPL12)

Sub-CLO

Sub CPMK-1: Students are able to explain the scope of geochemistry (CPMK-1)

Sub CPMK-2: Students are able to explain the structure and composition of geochemistry and radioisotopes (CPMK-1)

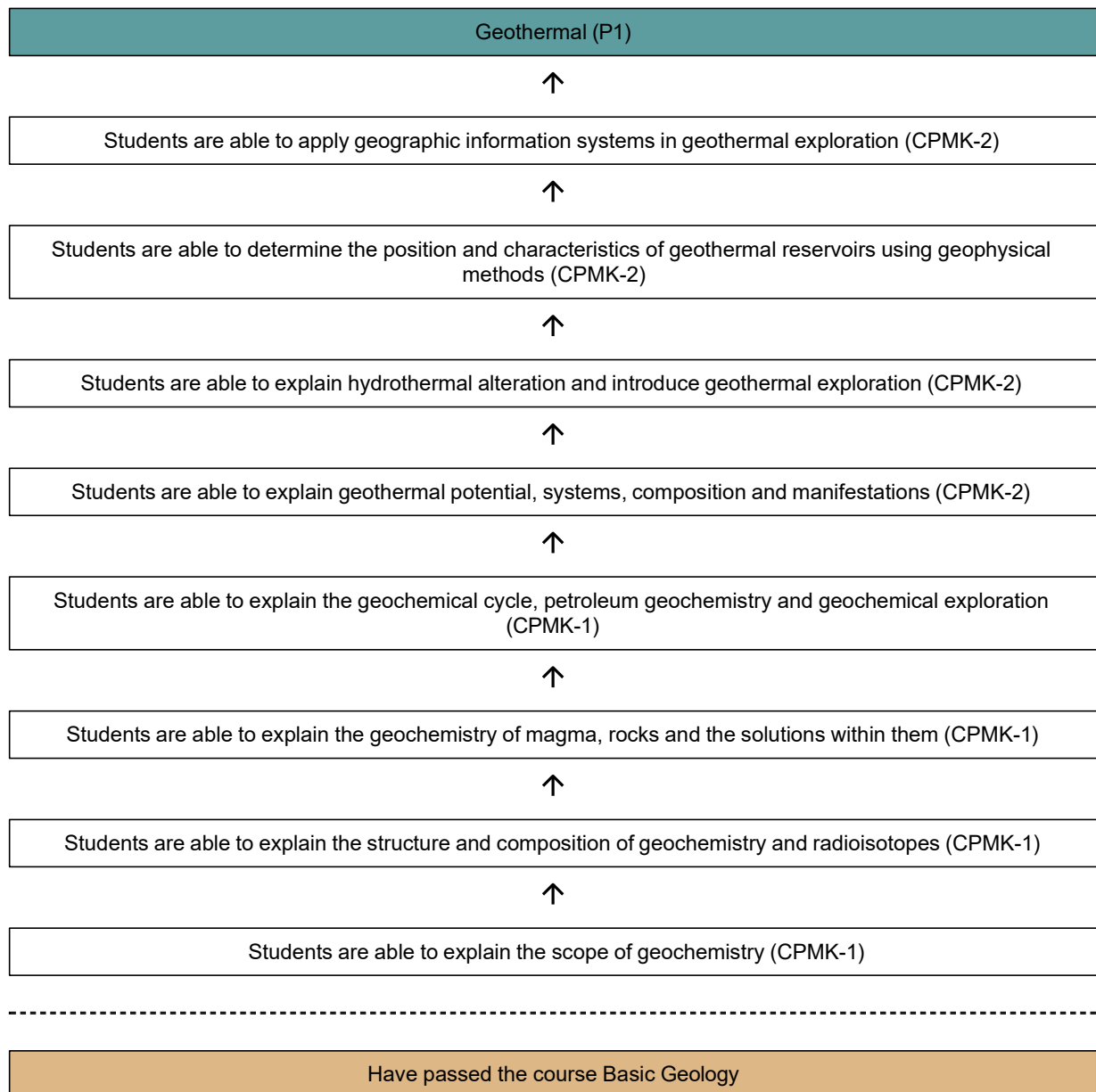
Sub CPMK-3: Students are able to explain the geochemistry of magma, rocks and the solutions within them (CPMK-1)

Sub CPMK-4: Students are able to explain the geochemical cycle, petroleum geochemistry and geochemical exploration (CPMK-1)

Sub CPMK-5: Students are able to explain geothermal potential, systems, composition and manifestations (CPMK-2)

- Sub CPMK-6: Students are able to explain hydrothermal alteration and introduce geothermal exploration (CPMK-2)
- Sub CPMK-7: Students are able to determine the position and characteristics of geothermal reservoirs using geophysical methods (CPMK-2)
- Sub CPMK-8: Students are able to apply geographic information systems in geothermal exploration (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
Geothermal (P1)		23H06131403	MK Main Expertise	3	5	1 Juli 2025
AUTHORITY		SLP Developer Lecturer	Coordinator		Head of Study Program	
		Ir. Bambang Hari Mei Soeprapto, M.Si., Dra. Maria, M.Si., Muhammad Fawzy Ismullah Massinai, S.Si, M.T	Ir. Bambang Hari Mei Soeprapto, M.Si.		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-12:	Mampu menemukan sumber Daya alam baru melalui proses eksplorasi, analisis, interpretasi data dan informasi berdasarkan prinsip-prinsip geofisika eksplorasi yang ramah lingkungan				
	SLO ⇒ Course Learning Outcomes					
	After completing this course, it is expected:					
	SLO-4	CLO-1: Students are able to explain geochemistry and its relationship with aspects of earth science and exploration				
	SLO-12	CLO-2: Students are able to explain geothermal potential in Indonesia and the geothermal exploration process, especially geophysical exploration				
	CLO ⇒ Sub-CLO					
	CLO-1	Sub-CLO-1:Students are able to explain the scope of geochemistry				
		Sub-CLO-2:Students are able to explain the structure and composition of geochemistry and radioisotopes				
		Sub-CLO-3:Students are able to explain the geochemistry of magma, rocks and the solutions within them				
		Sub-CLO-4:Students are able to explain the geochemical cycle, petroleum geochemistry and geochemical exploration				
	CLO-2	Sub-CLO-5:Students are able to explain geothermal potential, systems, composition and manifestations				
		Sub-CLO-6:Students are able to explain hydrothermal alteration and introduce geothermal exploration				
		Sub-CLO-7:Students are able to determine the position and characteristics of geothermal reservoirs using geophysical methods				
Sub-CLO-8:Students are able to apply geographic information systems in geothermal exploration						

	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						
				Participatory Activities	Task	Project/Case Study	Summative Test			
SLO-4	CLO-1	SUB-CLO-1	Participation	4	0	0	0	4		
SLO-4	CLO-1	SUB-CLO-2	Participation	0	12	0	0	12		
SLO-4	CLO-1	SUB-CLO-3	Participation	0	0	17	0	17		
SLO-4	CLO-1	SUB-CLO-4	Participation	0	0	7	10	17		
SLO-12	CLO-2	SUB-CLO-5	Participation	0	12	0	0	12		
SLO-12	CLO-2	SUB-CLO-6	Participation	0	0	11	0	11		
SLO-12	CLO-2	SUB-CLO-7	Participation	0	0	11	0	11		
SLO-12	CLO-2	SUB-CLO-8	Participation	0	0	6	10	16		
				4	24	52	20	100		
Course Description	This lecture explains geochemistry and geothermal exploration. Students learn about the scope of geochemistry; structure and chemical composition of the earth; geochronology, isotopes and radioactivity; geochemistry of magma and igneous rocks; geochemistry of solutions, sedimentation and sedimentary rocks; metamorphic geochemistry; geochemical cycles, petroleum geochemistry and exploration geochemistry. Then the next explanation is regarding geothermal potential in Indonesia and the geothermal system; geothermal manifestations, geothermal fluids and geothermal geochemistry; hydrothermal alteration and geothermal exploration; introduction to geothermal exploration using geophysical methods; geothermal exploration using geographic information systems; geothermal reservoir position using MT, gravity and magnetic methods; monitoring geothermal reservoirs using the microseismic method									
Learning Materials/Subjects	1. Geochronology, isotopes and radioactivity; 2. Geochemistry of igneous rocks; sedimentary and metamorphic 3. Geochemical exploration; 4. Hydrothermal alteration and geothermal exploration; 5. Geothermal exploration using geophysical methods;									
	Main References									

Reference		1. Armstead, H.C.H. 1978. Geothermal Energy. J. Willey. 2. Ellis, A.J. & Mahon, W.A.J. 1977. Geochemistry and Geothermal Systems. Academic Press. 3. Keller, G.V. 1981. Exploration for Geothermal Energy. Dev. In Geophysics, Exp. Method 2 ed. A A. Fitch, Ap. Sci.Pub, 1981. 4. Rybach, L & Muffler, L.J.P. 1981. Geothermal System Principles and Case Histories. J. Willey					
		Additional References					
		-					
Teaching Team		Ir. Bambang Hari Mei Soeprapto, M.Si., Syamsuddin, S.Si.,MT.					
Course requirement		Basic Geology					
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 are able to explain the scope of geochemistry (CPMK-1)	Formative: The accuracy of applying the concept of structural geology scope. Sumative: -	Formative Criteria: Participation dinilai dengan rubrik 1 Sumative Criteria: Participatory Activities (4) dinilai dengan rubrik 1 Assessment Technique: Non Test	Studying: Cooperative learning (Cooperative learning) TM [1x3x50`]		Lecture system & reference; Definition and limitations Geochemistry; The role of geochemistry in geology.	4

2-3	Students are able to explain the structure and composition of geochemistry and radioisotopes (CPMK-1)	Formative: Activity and clarity of the concepts of geothermal structure and composition as well as geochronology and radioactivity. Sumative: -	Formative Criteria: Participation Sumative Criteria: Task (12) Assessment Technique: Non Test	Studying: Group discussion (Small Group Discussion) TM [2x3x50`]		Nucleo-synthesis theory, meteorites and tektites; age of the universe; Distribution of elements in the universe; Earth: Interior structure, composition of the crust, mantle and core. Geochronology, isotopes and radioactivity	12
4-6	Students are able to explain the geochemistry of magma, rocks and the solutions within them (CPMK-1)	Formative: Activity and precision in explaining the geochemistry of magma, rocks and the solutions within them. Sumative: -	Formative Criteria: Participation Sumative Criteria: Project/Case Study (17) Assessment Technique: Non Test	Studying: Collaborative learning (Collaborative Learning) TM [3x3x50`]		Geochemistry of magma and igneous rocks; Geochemistry of sediments and sedimentary rocks and their solutions; Geochemistry of metamorphic rocks	17
7-8	Students are able to explain the geochemical cycle, petroleum geochemistry and geochemical exploration (CPMK-1)	Formative: Activity and accuracy in explaining geochemical cycles, petroleum geochemistry and geochemical exploration Sumative: -	Formative Criteria: Participation Sumative Criteria: Project/Case Study (7) dinilai dengan rubrik 1 Summative Test (10) dinilai dengan rubrik 1 Assessment Technique: Test and Non-Test	Studying: Collaborative learning (Collaborative Learning) TM [2x3x50`]		Geochemical cycles, petroleum geochemistry and geochemical exploration	17

9-10	Students are able to explain geothermal potential, systems, composition and manifestations (CPMK-2)	Formative: Activity and precision in explaining geothermal potential in Indonesia and geothermal systems, as well as geothermal composition and manifestation Sumative: -	Formative Criteria: Participation Sumative Criteria: Task (12) dinilai dengan rubrik 1 Assessment Technique: Non Test	Studying: Group discussion (Small Group Discussion) TM [2x3x50`]		Geothermal potential in Indonesia and the system geothermal; Geothermal composition and manifestations	12
11-12	Students are able to explain hydrothermal alteration and introduce geothermal exploration (CPMK-2)	Formative: Activity and accuracy in explaining hydrothermal alteration and geothermal exploration Sumative: -	Formative Criteria: Participation Sumative Criteria: Project/Case Study (11) dinilai dengan rubrik 1 Assessment Technique: Non Test	Studying: Collaborative learning (Collaborative Learning) TM [2x3x50`]		Hydrothermal alteration; Physical parameters in geothermal exploration.	11
13-14	Students are able to determine the position and characteristics of geothermal reservoirs using geophysical methods (CPMK-2)	Formative: Activity and accuracy in determining the position of geothermal reservoirs using MT, gravity and magnetic methods. Sumative: -	Formative Criteria: Participation Sumative Criteria: Project/Case Study (11) dinilai dengan rubrik 1 Assessment Technique: Non Test	Studying: Collaborative learning (Collaborative Learning) TM [2x3x50`]		MT, Gravity and Geomagnetic methods for geothermal exploration; Characterization of geothermal reservoirs using methods microseismic	11

15-16	Students are able to apply geographic information systems in geothermal exploration (CPMK-2)	Formative: Activity and accuracy in geographic information systems in geothermal exploration Sumative: -	Formative Criteria: Participation Sumative Criteria: Project/Case Study (6) dinilai dengan rubrik 1 Summative Test (10) dinilai dengan rubrik 1 Assessment Technique: Test and Non-Test	Studying: Case Study (Case Study) TM [2x3x50']		Sequence Preference Technique based on Similarity to Ideal Solutions (TOPSIS).	16
							100

Matrix of SLO, CLO, and Assessment Method

SLO / CLO	CLO-1	CLO-2
CPL-4 (P1)	Participatory Activities (Weight 4%) Task (Weight 12%) Project/Case Study (Weight 17%) Project/Case Study (Weight 7%) Summative Test (Weight 10%)	
CPL-12 (KK2)		Task (Weight 12%) Project/Case Study (Weight 11%) Project/Case Study (Weight 11%) Project/Case Study (Weight 6%) Summative Test (Weight 10%)

Evaluation Type and Assessment Weight

Type	Assessment Weight
Participatory Activities	4
Task	24
Project/Case Study	52
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						
				Participatory Activities	Task	Project/Case Study	Summative Test			
SLO-4	CLO-1	SUB-CLO-1	Participation	4	0	0	0	4		
SLO-4	CLO-1	SUB-CLO-2	Participation	0	12	0	0	12		
SLO-4	CLO-1	SUB-CLO-3	Participation	0	0	17	0	17		
SLO-4	CLO-1	SUB-CLO-4	Participation	0	0	7	10	17		
SLO-12	CLO-2	SUB-CLO-5	Participation	0	12	0	0	12		
SLO-12	CLO-2	SUB-CLO-6	Participation	0	0	11	0	11		
SLO-12	CLO-2	SUB-CLO-7	Participation	0	0	11	0	11		
SLO-12	CLO-2	SUB-CLO-8	Participation	0	0	6	10	16		
				4	24	52	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