UNDERGRADUATE PROGRAM

SEMESTER LESSON PLAN

2018 - 2022

GEOPHYSICAL ENGINEERING DEPARTMENT

Program Study	Geophysical Engineering Department
Course	Physical Geology
Course Code	RF184101
Semester	I (One)
Credit	3 (T:3) SKS
Lecturer	1. Dr.Ir. Amien Widodo. 2. M.Haris MF,S.T.,M.Eng.

Study Materials	Geology, mechanics		
Learning Outcome (LO)	Attitude	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.2	understanding geological knowledge that required to understand the geological process of a particular natural phenomena by its characteristics;
		3.3	understanding the theoretical concept of statistics to define the process complexity of a particular natural phenomena;

		3.8	understanding the principle and methods of mapping application that required in general geophysical engineering work;
		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
		3.13	understanding the insight of sustainable development in applied geophysical exploration methods and natural resource management in general;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.9	being able to recognize the difference of land and sea exploration field characteristics that can be affected into the quality of measurement data;

		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
		4.11	capable of reading maps and satellite imagery, determining map orientation in the field using GPS, compass and satellite data; and
		4.12	being able to criticize the complete operational procedures in solving the problems of geophysical engineering technology that has been and / or is being implemented, and poured in the form of scientific papers.
LO - Course	[C4,P4,A4] Students are able to identify and describe geological objects as well as explain the diagenesis of geological phenomena found in the field. Students are able to hold the basic knowledge which includes the mechanical and chemical process on Earth.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	2	3	4	5	6	7	8

1	[C4,P4,A4] Students are able to understand the basics of geophysical calculations from plate tectonics started from the concept of continental drift and seafloor spreading.	Introduction to geodynamics for geophysics, plate tectonics and mathematical equation for plate dynamics [K9] : Introduction to geodynamics for geophysics.ppt	Introductory Lecture, lecture contract and brainstorming	TM: 1x(3x50”) [BT+BM:2x(4x 60”)]	Discussion (plate dynamics in geophysics); Assignment-K10 : Plate dynamics and isostasy practice	Get to know the general formula of plate dynamics	10%
2	[C4,P4,A4] Students are able to understand the basics of geophysical calculations from plate tectonics started from the concept of continental drift and seafloor spreading.	Introduction to geodynamics for geophysics, plate tectonics and mathematical equation for plate dynamics [K9] : Introduction to geodynamics for geophysics.ppt	Introductory Lecture, lecture contract and brainstorming	TM: 1x(3x50”) [BT+BM:2x(4x 60”)]	Discussion (plate dynamics in geophysics); Assignment-K10 : Plate dynamics and isostasy practice	Get to know the general formula of plate dynamics	10%

3	[C4,P4,A4] Students are able to understand the basics of geophysical calculations from plate tectonics started from the concept of continental drift and seafloor spreading.	Introduction to geodynamics for geophysics, plate tectonics and mathematical equation for plate dynamics [K9] : Introduction to geodynamics for geophysics.ppt	Introductory Lecture, lecture contract and brainstorming	TM: 1x(3x50”) [BT+BM:2x(4x 60”)]	Discussion (plate dynamics in geophysics); Assignment-K10 : Plate dynamics and isostasy practice	Get to know the general formula of plate dynamics	10%
4	[C4,P4,A4] Students are able to understand the basics of geophysical calculations from plate tectonics started from the concept of continental drift and seafloor spreading.	Introduction to geodynamics for geophysics, plate tectonics and mathematical equation for plate dynamics [K9] : Introduction to geodynamics for geophysics.ppt	Introductory Lecture, lecture contract and brainstorming	TM: 1x(3x50”) [BT+BM:2x(4x 60”)]	Discussion (plate dynamics in geophysics); Assignment-K10 : Plate dynamics and isostasy practice	Get to know the general formula of plate dynamics	10%

5	[C4,P4,A4] Students are able to understand the basics of geophysical calculations from plate tectonics started from the concept of continental drift and seafloor spreading.	Introduction to geodynamics for geophysics, plate tectonics and mathematical equation for plate dynamics [K9] : Introduction to geodynamics for geophysics.ppt	Introductory Lecture, lecture contract and brainstorming	TM: 1x(3x50") [BT+BM:2x(4x 60")]	Discussion (plate dynamics in geophysics); Assignment-K10 : Plate dynamics and isostasy practice	Get to know the general formula of plate dynamics	10%
6	[C4,P4,A4] Students are able to understand the basics of geophysical calculations from plate tectonics started from the concept of continental drift and sea floor spreading.	Introduction to geodynamics for geophysics, plate tectonics and mathematical equation for plate dynamics [K9] : Introduction to geodynamics for geophysics.ppt	Introductory Lecture, lecture contract and brainstorming	TM: 1x(3x50") [BT+BM:2x(4x 60")]	Discussion (plate dynamics in geophysics); Assignment-K10 : Plate dynamics and isostasy practice	Get to know the general formula of plate dynamics	10%

7	[C4,P4,A4] Students are able to understand the basics of geophysical calculations from plate tectonics started from the concept of continental drift and seafloor spreading.	Introduction to geodynamics for geophysics, plate tectonics and mathematical equation for plate dynamics [K9] : Introduction to geodynamics for geophysics.ppt	Introductory Lecture, lecture contract and brainstorming	TM: 1x(3x50") [BT+BM:2x(4x 60")]	Discussion (plate dynamics in geophysics); Assignment-K10 : Plate dynamics and isostasy practice	Get to know the general formula of plate dynamics	10%
8	Mid Semester Evaluation						30%
9	[C4,P4,A4] Students are able to understand the basics of geophysical calculations from plate tectonics started from the concept of continental drift and seafloor spreading.	Introduction to geodynamics for geophysics, plate tectonics and mathematical equation for plate dynamics [K9] : Introduction to geodynamics for geophysics.ppt	Introductory Lecture, lecture contract and brainstorming	TM: 1x(3x50") [BT+BM:2x(4x 60")]	Discussion (plate dynamics in geophysics); Assignment-K10 : Plate dynamics and isostasy practice	Get to know the general formula of plate dynamics	

10	[C4,P4,A4] Students are able to understand continental dynamics and deformation between plates with geophysics (gravity and isostasy)	Introduction to deformation, the basic concept of gravity and plate isostasy [K10] : Introduction to gravity and isostasy.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x 60”)]	Discussion (plate dynamics in geophysics); Assignment-K10 : Plate dynamics and isostasy practice	the accuracy of explaining	5%
11	[C4,P4,A4] Students are able to analyse stress and strain	The concept and measurement of stress and strain [K11] : deformation, stress and strain.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion	the accuracy of explaining and comparing	
12	[C4,P4,A4] Students are able to understand the basic rheology	The basic concept and measurement of rheology [K12] : Introduction to reology.ppt	Direct Lecture, Discussion, Video;	TM: 1x(3x50”)	Discussion Quiz-K12 :stress and strain	the accuracy of explaining	5%

13	[C4,P4,A4] Students are able to understand the concept of hotspot formation/volcanism and its relation to the plate movement, tectonic plume, fluid mechanics	The basic concept of fluid mechanics and volcanism [K13] : Introduction to fluid mechanics and vulcanism.ppt	Direct Lecture, Discussion, Video;	TM: 1x(3x50") [BT+BM:2x(4x 60")]	Discussion Assignment-K13 : Practice in making a language program for flow simulation in the Earth	the accuracy of explaining	10%
14	[C4,P4,A4] Students are able to understand the principle of heat transfer occurrence/ whole mantle convection	Heat transfer concept [K14] : Introduction to heat transfer.ppt	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	the accuracy of explaining	
15	[C4,P4,A4] Students are able to understand the study case of Geodynamics through Geophysics	Study case comprehension in geodynamics through geophysics [K15] : Journal.ppt	Discussion;	TM: 1x(3x50") [BT+BM:2x(4x 60")]	Discussion Assignment-K15 :Presentation and resume study deodynamics in geophysics	the accuracy of explaining	
16	End Semester Evaluation						30%

REFERENCES :

1. Hamblin, W.K., 1982; The Earth's Dynamic Systems; 3rd Edition. Minesotta.
2. Thomson and Turk, 2007, Physical Geology, Sounders Golden series
3. Wilson, T. et al., "Physics and Geology", McGraw-Hill, 1975
4. Dana's Manual of Mineralogy, John Wiley and Sons, Inc., New York
5. Turcotte, D.L. and Schubert, G., 1982, Geodynamics : Applications of Continuum physics to geological problems, John Willey & Sons. Inc
6. Blatt, H., Tracy, R.J., Owens, B.R., 2006,Petrology: Igneous, Sedimentary, and Metamorphic,3 rd

Program Study	Geophysical Engineering Department
Course	Introduction to Geophysical Engineering
Course Code	RF184102
Semester	I (One)
Credit	2 (T:2) SKS
Lecturer	Dr. Widya Utama, DEA

Study Materials	Geology, Physics		
Learning Outcome (LO)	Attitude	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
	Knowledge	3.3	understanding the principle and methods of applied geophysics engineering started from acquiring data, processing and modelling for problem solving in certain fields in deep;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;

		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
LO - Course	[C4,P3,A3] Students are able to recognise the physical characteristics of geological phenomena on Earth's surface through simple geophysical methods to acquire subsurface model and Earth's crust dynamics. By constructing and using simple model, students are able to understand its usefulness based on the exploration purpose		

Week	**The Expected of Sub LO - Course**	**Learning Subject**	**Learning Methods**	**Time Estimation**	**Student's Learning Experience**	**Criteria and Indicators**	**Weight (%)**
1	2	3	4	5	6	7	8
1	GEOPHYSICAL GENERAL REVIEW IN SCIENCE	1. Geophysical status in geosciences 2. Investigation Geophysics 3. Applied geophysics in geosciences on a large-scale *Widiyantoro (Bab I; Kearey & Vine Chapter 1*	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion	Explain geophysics existence in geosciences as well as its part in study the Earth	-
2	Theory of Earth's Formation	1. Introduction *Widiyantoro (Bab I)*	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion, assignment	Explain the origin of human assumption on Earth's formation	5%

3	SHAPE AND SIZE OF THE EARTH	1. Earth as a perfect spherics 2. Earth as a round ellipsoid 3. Earth as a triaxial ellipsoid 4. Earth's shape from satellite observation *Tachyudin (Bab II)*	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion	Explain the invention of Earth's shape and size	-
4	EARTH'S INTERIOR AND SEISMOLOGY	1. Determination of Earth's mass, moment of inertia, and rotation 2. Determination of Earth's density value, constant and gravity acceleration *Widiyantoro (Bab 2-4)*	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion, quiz	Explain the determination of Earth's physical parameters	10%
5	EARTHQUAKE (1)	1. Mechanism, source, location, parameters, and instrumentation of earthquake *Fowler (Chapter 2-4)*	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion, assignment	Explain about earthquake and things related to it.	5%
6	EARTHQUAKE (2)	1. The theory of elastic wave, seismic wave characterization, seismic phase, and their relation to earthquake *Fowler (Chapter 2-4)*	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion	Explain the seismic wave propagation and its relation to earthquake	-

7	EARTHQUAKE (3)	1. The implication of seismology in Earth's interior structure 2. The implication of other geosciences in Earth's interior structure *Fowler (Chapter 2-4)*	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion	Explain the implication of seismology in study the Earth's interior structure	-
8	Mid Semester Evaluation						30%
9	GRAVITY	1. Introduction 2. Basic concept of gravity 3. Earth's potential and gravity acceleration 4. Earth's gravity acceleration *Fowler Chapter (5)*	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion	Explain the basic concept of gravity	-
10	GRAVITY	1. Gravity acceleration measurement 2. Earth's shape and illustration 3. Geoid and gravity anomaly	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion, assignment	Explain gravity measurement and its part in knowing Earth's shape and illustration	5%
11	GRAVITY	1. The concept and calculation of isostasy 2. Flexure litosfer and mantle viscosity	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion	Explain the concept of isostasy and flexure lithosphere to understand Earth's crust dynamics	-

12	EARTH MAGNETISM	1. The concept and scope of basic geomagnetic 2. Measurement of magnetic field, prime field (properties and cause) and the theory of dynamo *Tachyudin (Bab IV)*	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion, quiz	Explain the basic concept and measurement of geomagnetic field	10%
13		1. Secular variation and external magnetic field 2. Rock magnetism	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion, assignment	Explain the basic concept of paleomagnetic, external magnetic field and how to record a magnetism in a rock	5%
14	HEAT FLOW ON EARTH	1. Introduction 2. Conductive heat flow and simple geothermal calculation 3. Heat flow on Earth *Tachyudin (Bab VI)*	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion	Explain the mechanism of heat flow on Earth's surface	-
15	HEAT FLOW ON EARTH	1. Adiabatic process, melting in mantle, and convection on mantle 2. Core thermal structure and forces that work on a plate	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion	Menjelaskan mekanisme aliran panas di bagian dalam bumi. Explain the mechanism of heat flow in Earth’s subsurface	-

16	End Semester Evaluation	30%

REFERENCES :

1. Reynolds, John M., 1997, An Introduction to Applied and Environmental Geophysics, John Wiley & Sons, England.
2. Jones, E. J. , 1999, Marine Geophysics, John Wiley & Sons.
3. Turcotte, D.L. , 1982, Geodynamics Application of continue Physics to geological Problems, John Wiley & Sons
4. Fowler, C.M.R. , 1990, The Solid Earth. Cambridge University Press.
5. Fu, L., and Cazenave, A., satellite altimetry and Earth sciences, Academic Press, 2001.

Program Study	Geophysical Engineering Department
Course	Geophysical Computing
Cource Code	RF184203
Semester	II (Two)
Credit	3 (Three) SKS
Lecturer	Dr. Dwa Desa Warnana, S.Si., M.Si.

Study materials	Progamming, Mathematics		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.5	understanding the concepts, principles and techniques of system design, process or application component of geophysical engineering in procedurally starting from data retrieval, processing, interpretation and modeling to solve the problems of geophysical engineering in depth;
		3.6	understanding the complete operational knowledge related to the field of geophysical engineering technology;
		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
		3.12	understanding the concept, principle, workshop procedure, studio and laboratory activities, and Health and Safety Environment (HSE) in general;

	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
LO – Course	[C3,P3,A3] Students are able to apply the basics of programming, concepts, and application in geoscience field.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Students can understand the basics of MATLAB programming.	MATLAB programming.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion	Liveliness of interact	-
2	Students can solve a system of linear equations numerically (MATLAB)	Numerical linear equation solving (MATLAB)	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion, task	Task result	5%
3	Students can do numerical computations from inverse matices.	Numerical inverse matrix computation.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion	Liveliness of interact	-

4	Students can do numerical computation using the decomposition method.	Numerical computation using the decomposition method.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion, quiz	Quiz result	10%
5	Students can do numerical computation using the iterative method.	Numerical computation using the iterative method	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion, practicum	Practicum report	5%
6	Students can do interpolation numerical computing.	Interpolation numerical computing	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion, practicum	Practicum report	5%
7	Students can do extrapolation numerical computing.	Extrapolation numerical computing	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion	Liveliness of interact	-
8	Mid Semester Evaluation						25%
9	Students can do numerical curve fitting computing.	Numerical curve fitting computing.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion	Liveliness of interact	-
10	Students can compute numerical nonlinear equations.	Numerical computation of	Direct Lecture 120 minute	150 minute	Presentation, discussion, task	Task result	5%

		nonlinear equations.	Discussion 30 minute				
11	Students can do differential numerical computing.	Differential numerical computing.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion	Liveliness of interact	-
12	Students can do integral numerical computing.	Integral numerical computing.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion, quiz	Quiz result	10%
13	Students can understand numerical computing in the geophysics field.	Numerical computing in the geophysics field.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion, practicum	Practicum report	5%
14	Students can understand numerical computing in the geophysics field.	Numerical computing in the geophysics field.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion, practicum	Practicum report	5%
15	Students can understand numerical computing in the geophysics field.	Numerical computing in the geophysics field.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion	Liveliness of interact	-
16	End Semester Evaluation						25%

REFERENCES :

1. Yang , W.Y., Chung, W.T., Morris, J., "Applied Numerical Methods Using MATLAB"., John Wiley & Sons,200
2. Kiusalaas, J., "Numerical Methods in Engineering with MATLAB.", cambridge university press, 2005

Program Study	Geophysical Engineering Department
Course	Fundamental Electronics
Course Code	RF184304
Semester	3 (T:2, R:1) SKS
Credit	III (Three)
Lecture	Mariyanto

Study Materials	Electricity, Mathematics		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.2	being able to show independent, quality, and measurable performance;
	Knowledge	3.4	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex

			engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
LO – Course	[C3,P3,A2] Students can explain and apply laws, basic theorems of electronics, the characteristics and way of working of the electronic components to solve electronic circuit problems.		

Week	**The Expected of Sub LO - Course**	**Learning Subject**	**Learning Methods**	**Time Estimation**	**Student's Learning Experience**	**Criteria and Indicators**	**Weight (%)**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Students are able to explain the basic of electrical circuits.	Bacics concepts, charge, current, voltage	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion	Liveliness of interact	-
2	Students are able to explain the law of conservation of energy, power, and circuit elements.	The law of conservation energy, power, and circuit elements.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion, Task	Task result	5%
3	Students are able to explain the basic laws of electronics and parts of the circuit.	Ohm's law, node, branch, loop, Kirchhhoff's current law, Kirchhhoff's voltage law.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion	Liveliness of interact	-

4	Students can use voltage and current divider methods to solve circuit problems.	Resistor, voltage divider circuit, current divider circuit, wye-delta transformation.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion, quiz	Quiz result	10%
5	Students are able to solve series problems using Node analysis method.	Node analysis method.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion, Practicum	Practicum report	5%
6	Students are able to solve series problems using Mesh analysis method.	Mesh analysis method.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion, Practicum	Practicum report	5%
7	Students are able to apply Node and Mesh analysis method for supernode and supermesh cases.	Supernode, supermesh	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion	Liveliness of interact	-
8	Mid Semester Evaluation						25%
9	Students are able to solve the diode and transistor circuit problems.	Diode, transistor	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion	Liveliness of interact	-
10	Students are able to understand the	Capasitor and inductor circuits, the equivalent	Direct Lecture 120 minute	150 minute	Presentation, Discussion, Task	Task result	5%

	capacitor and inductor circuits.	value of a series and parallel arrangement	Discussion 30 minute				
11	Students are able to solve the problems of the 1st orde series.	RC and RL circuits are free source, RC and RL circuits with short responses.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion	Liveliness of interact	-
12	Students are able to solve the problems of the 2nd orde series.	Source-free RLC circuit, RLC circuit with short response.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion, quiz	Quiz result	10%
13	Students are able to understand sinusoid signals and phasor analysis.	Sinusoid signals and phasor analysis.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion, Practicum	Practicum report	5%
14	Students are able to apply sinusoidal steady-state analysis.	Sinusoidal steady-state analysis, superposition theorem, source transformation.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion, Practicum	Practicum report	5%
15	Students are able to apply AC electrical power analysis.	AC electrical power analysis	Direct Lecture 120 minute Discussion	150 minute	Presentation, Discussion	Liveliness of interact	-

			30 minute				
16	End Semester Evaluation						25%

REFERENCES :

1. Alexander, CK., Sadiku, MNO., Fundamental of Electric Circuits, McGraw-Hill, New York
2. Johnson, David E, et al., Electric Circuit Analysis, Prentice-Hall Inetrnational Edition

Program Study	Geophysical Engineering Department
Course	Rock Physics
Course Code	RF184305
Semester	III (Three)
Credit	4 (T:3,P:1) SKS
Lecturer	Anik Hilyah, S.Si., M.T.

Study Materials	Intoduction: background and basic understanding of rock physics, rocks as part of the earth's crust and soil as a result of chemical-physical weathering of rocks, rocks and soil as a constituent of tha earth's crust. Measurement and modeling of rock physics characteristics: design of acquisition and measurement of rock physics data at the laboratory scale and its development at the field scale. Variables and parameters of rock characteristics: solid materials (matrix), pore space and fluid content in the pores that affect each other. Application: relation of rock characteristics at various scales of rock phyics measurement and its application in geophysical exploration in the field.		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;

	Knowledge	3.1	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
	Specific Skills	4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
LO - Course	[C4,P4,A4] Students can design simple measurement systems (tools and methodologies) to be followed up by measuring laboratory scale rock physics variables. Students are able to understand the concepts and relationships between rock physical variables to extract important parameters of rocks for explorations purposes.		

Week	**The Expected of Sub LO - Course**	**Learning Subject**	**Learning Methods**	**Time Estimation**	**Student's Learning Experience**	**Criteria and Indicators**	**Weight (%)**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Students are able to know what will be learned in the Rock Physics course and understand the classification and characteristics of each rock.	▪ Introduction of rock phyics ▪ General classification and characteristics of igneous, sedimentary, and metamorphic rocks.	Direct lecture and discussion	150 minute	Discussion and task	The ability to describe each rocks.	1,8 %

2	Students are able to know various physical parameters of rock pore space.	▪ Porosity ▪ Specific Internal Surface ▪ Saturation ▪ Permeability ▪ Wettability ▪ Capillary Pressure ▪ Sandstone case study	Direct lecture and discussion	150 minute	Presentation, discussion and task	Able to read simple log data shows the physical parameters of rocks.	1,8 %
3	Students are able to understand NMR's principles and their application in the log data.	▪ The principle of NMR measurement ▪ Relaxation mechanism ▪ Case Study	Direct lecture and discussion	150 minute	Presentation, discussion and task	Able to explain the principle of NMR physically and numerically.	1,8 %
4	Students are able to understand the concept of density and measurement method in laboratory.	▪ Definisi dan jenis densitas ▪ Densitas berbagai batuan	Direct lecture and discussion	150 minute	Presentation, discussion	Able to distinguish between types of density and taje laboratory scale measurements.	1,8 %
5	First Quiz (Formative Evaluation – Evaluation which is intended to improve the learning process based on the assessment that has been done)						10 %
6	Students are able to understand application of radioactive method on formation evalution.	▪ The Concept of radioactive ▪ Nature radioactivity ▪ Gamma radiation ▪ Netron raduation	Direct lecture and discussion	150 minute	Presentation, discussion and task	Able to understand the principle of radioactive measurement.	1,8 %

		▪ Radioactive applications in formation ▪ Sandstone case study					
7	Student are able to understand the elastic properties of rock and its application to seismic.	▪ Elasticity of rocks ▪ Velocity of igneous, sedimentary, and metamorphic rocks. ▪ Anisotrophy ▪ Attenuation ▪ Sandstone case study	Direct lecture and discussion	150 minute	Presentation, discussion	Able to distinguish primary and secondary wave velocity.	1,8 %
8	Mid Semester Evaluation (Formative Evaluation: Evaluation which is intended to improve the learning process based on the assessment that has been done)						20 %
9	Students are able to understand geomechanical concepts and its application to geotechnics.	▪ Basic concepts of geomechanics ▪ Geomechanical processes ▪ Correlation between static and dynamic modulus ▪ Correlation between seismic velocity and rock strength	Direct lecture and discussion	150 minute	Presentation, discussion and task	Able to understand stress, strain, and its application.	1,8 %

10	Students are able to understand the electrical properties of rocks and its application in log data.	▪ Electrical properties of rocks ▪ Resistivity of rocks ▪ Clean rocks ▪ Shaly rocks ▪ Dielectric properties of rocks ▪ Sandstone case study	Direct lecture and discussion	150 minute	Presentation, discussion	Able to read resistivity value in the log data.	1,8 %
11	Students are able to understand the electrical properties of rocks and its application in log data.	▪ Electrical properties of rocks ▪ Resistivity of rocks ▪ Clean rocks ▪ Shaly rocks ▪ Dielectric properties of rocks ▪ Sandstone case study	Direct lecture and discussion	150 minute	Presentation, discussion	Able to read resistivity value in the log data.	1,8 %
12	Quiz 2 (Formative-Evaluation Evaluation intended to improve the learning process based on the assessment that has been done)						10 %
13	Students are able to understand the thermal concepts of rocks.	▪ Thermal properties in minerals and pore fillers ▪ Thermal properties of rock ▪ Models	Direct lecture and discussion	150 minute	Presentation, discussion and task	Able to understand the thermal processes in rocks.	1,8 %
14	Students are able to understand the	▪ The basic concept of magnetic	Direct lecture and discussion	150 minute	Presentation, discussion and task	Able to distinguish various types of	1,8 %

	magnetic properties of rocks.	▪ Magnetic properties of rocks.				magnetic properties of the rocks.	
15	Correlation between physical parameters.	▪ Log interprestation for determining porosity and mineral composition ▪ Correlation between thermal conductivity and elastic wave velocity	Direct lecture and discussion	150 minute	Presentation, discussion	Able to know the correlation between the properties of rock physics.	1,8 %
16	End of Semester Evaluation						20 %

REFERENCES :

1. Schoon, J.H., 1998, Physical Properties of Rocks: Fundamental and Principles Of Petrophysics, Pergamon.
2. Bowless J E, 1979, Physical and Geotechnical Properties of Soils, Mc Graw hill Co, Tokyo.
3. Mavko, Gary., et al, 2009, The Rock Physics Handbook, Cambridge University Press, UK.
4. Terzghy K, dkk, 1997, Soil Mechanics in Enginering Practise, Prantice Hall, NY.

Program Study	Geophysical Engineering Department
Course	Mathematical Geophysics
Course Code	RF184306
Semester	4 (T:3,R:1) SKS
Credit	III (Three)
Lecturer	1. Dr. Ayi Syaeful Bahri, S.Si., M.T. 2. Mariyanto, S.Si., M.T. 3. M. Singgih Purwanto, S.Si., M.T.

Study Materials	Physics, Mathematics		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
	Knowledge	3.1	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
LO - Course	[C3,P3,A3] Students are able to apply the basic concepts of Geophysical Mathematics and apply them in the Geophysics problems. Students are able to solve vector problems, SPL, matrices, series, complex numers, integrals, Ordinary Differential problems, Partial Differential Equations, Fourier, and other special functions.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Students are able to understand the importance of mathematics to solving geophysical problems.	Introduction, the bacis concepts of mathematic in Geophysics.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion	Liveliness of interact	-
2	Students are able to solve the convergence test.	Series, convergent series, divergent series, convergent test, rank series	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion, task	Task result	5%
3	Students are able to solve complex algebra problems.	Complex numbers, complex fields, complex algebra.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion	Liveliness of interact	-
4	Students are able to do calculation with Euler's formula.	Infinite series, complex rank, euler formula, rank and root of complex numbers.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion, quiz	Quiz resut	10%
5	Students are able to solve trigonometric, exponential,	Trigonometric functions, exponential	Direct Lecture 120 minute	150 minute	Presentation, discussion, task	Task result	5%

	logarithmic, hyperbolic function equations.	functions, logarithmic functions, hyperbolic function.	Discussion 30 minute				
6	Students are able to solve linear algebra problems.	Linear algebra, matrice, determinats, cramer rules.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion	Liveliness of interact	-
7	Students are able to solve matrix operations.	Vector, line, area, matrix operation.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion	Liveliness of interact	-
8	Mid Semester Evaluation						30%
9	Students are able to solve partial derivative problems.	Partial derivatives, chain rules, implicit derivatives.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion	Liveliness of interact	-
10	Students are able to solve partial derivative application problems.	Partial derivative application for minimum maximum cases, Lagrange multiplers, Leibniz rules.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion, task	Task result	5%

11	Students are able to do fold integral calculations.	Fold integrals, double integrals, triple integrals.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion	Liveliness of interact	-
12	Students are able to solve integral application problems.	Jacobian, surface integrals, application integrals.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion, quiz	Quiz resut	10%
13	Students are able to solve vector problems.	Vector analysis, vector multiplication, vectir derivation, terrain, gradient.	Kuliah 120 menit Diskusi 30 menit	150 minute	Presentation, discussion, task	Task result	5%
14	Students are able to do vector operations.	Integral lines, green theorem, divergence, curl, stokes theorem.	Kuliah 120 menit Diskusi 30 menit	150 minute	Presentation, discussion	Liveliness of interact	-
15	Students are able to solve partial differential equations.	Persamaan diferensial parsial, persamaan laplace, persamaan poisson	Kuliah 120 menit Diskusi 30 menit	150 minute	Presentation, discussion	Liveliness of interact	-
16	End Semester Evaluation						30%

REFERENCES :

1. Hubral, P., Mathematical Methods for Geophysics, University of Karlsruhe Press, 2001.
2. Michael S. Zhdanov, Geophysical Inverse Theory and Regularization Problems, Elsevier, 2002.
3. Boas, ML, Mathematical Method in Physical Sciences, Jhon Wiley and Sons 3rd edition, 2006.
4. Kreyzig, Erwin, advance Engineering Mathematics, Jhon Wiley and Sons 9th edition, 2006

Program Study	Geophysical Engineering Department
Course	Structural Geology
Course Code	RF184307
Semester	III (Three)
Credit	3 (T:2, P:1) SKS
Lecturer	Dr. Ir. Amien Widodo, M.S.

Study Materials	Geology, Mechanics, Deformation, Petrology		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.2	understanding geological knowledge that required to understand the geological process of a particular natural phenomena by its characteristics;
		3.8	understanding the principle and methods of mapping application that required in general geophysical engineering work;

		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
		3.13	understanding the insight of sustainable development in applied geophysical exploration methods and natural resource management in general;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.9	being able to recognize the difference of land and sea exploration field characteristics that can be affected into the quality of measurement data;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
		4.11	capable of reading maps and satellite imagery, determining map orientation in the field using GPS, compass and satellite data; and
LO - Course	[C4,P4,A4] Students are able to identify the elements of geological structure, able to describe and analyse as well as explain a geological structure event. Students are able to define the correlation between tectonic and geological structure event.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	2	3	4	5	6	7	8
1	[C4,P4,A4] Students are able to understand structural geology and Earth's constituent components(Earth Structure)	Introduction to Earth Structure [K1] : Earth Structure.ppt	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50")	Discussion (Comprehension of Earth's components from the core to the crust and its relation to structural geology)	the accuracy of explaining	
2	[C4,P4,A4] Students are able to understand crust deformations (Divergent, Convergent, and Transform)	Introduction to Crust Deformation [K2] : Tectonic Deformation Part 1.ppt	Direct Lecture, Discussion;	TM: 1x(3x50") [BT+BM:2x(4 x60")]	Discussion (types of tectonic crust movement); **Assignment-K2 : Resume on divergent, convergent, and transform process**	Get to know of plate movements	
3	[C4,P4,A4] Students are able to explain the difference of Brittle and Ductile	Introduction to Sedimentary Stratigraphy on sedimentary depositional environment [K3] : Brittle and Ductile.ppt	Direct Lecture, Discussion;	TM: 1x(3x50") [BT+BM:2x(4 x60")]	Discussion (sedimentary depositional environment); **Assignment-K10 :depositional environment through rock components exercises**	Get to know of sedimentary depositional environment	

4	[C4,P4,A4] Students are able to classified sedimentary rock through its component and its depositional environment	The concept of sedimentary stratigraphy on various depositional environment [K4] : Introduction to sedimentary depositional environment.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4 x60”)]	Discussion (sedimentary depositional environment); **Assignment-K4 : Make a sedimentary rocks classification table**	Get to know clearly of sedimentary rock classification	
5	[C4,P4,A4] Students are able to understand carbonate sedimentary rock	The concept of sedimentary stratigraphy on carbonate sedimentary rock [K5] : Introduction to carbonate sedimentary rock.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4 x60”)]	Discussion (carbonate sedimentary rock); **Quiz-K5 : Clastic Rock and Carbonate Rocks (components)**	Get to know of carbonate rocks component	
6	[C4,P4,A4] Students are able to understand the genesis of carbonate rocks (differences in clastic rocks genesis)	The concept of sedimentary stratigraphy on carbonate sedimentary rock [K5] : Introduction to carbonate rocks genesis.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4 x60”)]	Discussion (plate dynamics in geophysics); **Assignment-K6 : carbonate rocks genesis exercises**	Get to know of carbonate rocks genesis	

7	[C4,P4,A4] Students are able to understand the genesis of sedimentary rocks, the components, textures, structures, minerals, as well as explain the depositional environment and its classification	The concept of sedimentary stratigraphy on clastic and non-clastic rocks [K7] : Resume of sedimentary stratigraphy on clastic and non-clastic rocks.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4 x60”)]	Discussion (clastic and non-clastic rocks); **Assignment-K7 : differences between clastic and non-clastic rocks exercise**	Get to know the differences between clastic and non-clastic rocks	
8	Mid Semester Evaluation						30%
9	[C4,P4,A4] Students are able to understand about stratigraphy and the laws of stratigraphy	Introduction to sedimentary stratigraphy, the principle of stratigraphy [K9] : Introduction to the principle of stratigraphy.ppt	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50”)	Discussion (the principle of stratigraphy);	Get to know the laws of stratigraphy	
10	[C4,P4,A4] Students are able to understand the differences in stratigraphic science (lithostratigraphy, chronostratigraphy, biostratigraphy)	Introduction to lithostratigraphy, chronostratigraphy, and biostratigraphy [K10] : Introduction to advanced stratigraphy.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4 x60”)]	Discussion (comprehensive knowledge in stratigraphy); **Assignment-K10 : lithostratigraphy, chronostratigraphy, and biostratigraphy exercises**	the accuracy of explaining	5%

11	[C4,P4,A4] Students are able to analyse the correlation of rocks	The basic concept of sedimentary rocks correlations (understand datum/keybed) [K11] : rocks correlation.ppt	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	the accuracy of comparing and explaining	
12	[C4,P4,A4] Students are able to analyse the correlation of rocks (lithocorrelation, chronocorrelation, and biocorrelation)	Comprehension of the differences in lithocorrelation, chronocorrelation, and biocorrelation [K12] : lithocorrelation, chronocorrelation, and biocorrelation.ppt	Direct Lecture, Discussion, Video;	TM: 1x(3x50")	Discussion **Quiz-K12 : Stratigraphy and Correlation**	the accuracy of explaining	5%
13	[C4,P4,A4] Students are able to read a regional stratigraphy and its use	The basic concept of regional stratigraphy reading [K13] :Regional geology map.ppt	Direct Lecture, Discussion, Video;	TM: 1x(3x50") [BT+BM:2x(4 x60")]	Discussion **Assignment -K13 : Practice on simulating the flow in the earth with program language**	the accuracy of explaining	10%

14	[C4,P4,A4] Students are able to understand the sequence stratigraphy	The concept of sequence stratigraphy [K14] : Introduction to Sequence Stratigraphy.ppt	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	the accuracy of explaining	
15	[C4,P4,A4] Students are able to understand a stratigraphy, correlation, and sequence of rocks	Comprehensive understanding of sedimentary stratigraphy [K15] : Journal.ppt	Discussion	TM: 1x(3x50") [BT+BM:2x(4 x60")]	Discussion **Assignment-K15 : Presentation and resume about sedimentary stratigraphy**	the accuracy of explaining	
16	End Semester Evaluation						30%

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1. "Billings, M.P., 1982, Structural Geology, Prentice Hall, New Delhi.
2. Ragan, D. R., Structural Geology, Geometrical Technique, 1979, John Willey
3. Davis,G.H.,Reynolds,S.J.,and Kluth,C.F.,2012,Structural Geology of Rock and Regions: 3rd edition, John and Wiley and Sons,Inc.,835p.
4. Fossen,H.,2010,Structural Geology,Cambridge University Press.,463p.
5. Modul Praktikum Geologi Struktur Departemen Teknik Geofisika ITS
6. Twiss, R. J. and Moore, E. M., 1992, Structural Geology: W. H. Freeman and Company, 532 p.
7. Suppe, J., 1985, Principles of Structural Geology: Prentice-Hall, Inc., 537p."

Program Study	Geophysical Engineering Department
Course	Sedimentology and Stratigraphy
Course Code	RF184308
Semester	III (Three)
Credit	3 (T:3) SKS
Lecturer	Dr. Ir. Amien Widodo, M.S.

Study Materials	Geology, Mechanics, Sediments, Stratigraphy		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.2	understanding geological knowledge that required to understand the geological process of a particular natural phenomena by its characteristics;
		3.8	understanding the principle and methods of mapping application that required in general geophysical engineering work;

		3.10	understanding the concepts and principles of environmental preservation in general from geophysical engineering activities;
		3.13	understanding the insight of sustainable development in applied geophysical exploration methods and natural resource management in general;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.9	being able to recognize the difference between land and sea exploration field characteristics that can be affected into the quality of measurement data;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
		4.11	capable of reading maps and satellite imagery, determining map orientation in the field using GPS, compass and satellite data; and

CP – Mata Kuliah	[C4,P4,A4] Students are able to understand sedimentary rock genesis and its relation in time and space. Both definitions are used to understand the geometry of sedimentary rock layers that use to interpret the distribution and properties of the rock, along with its interpretation and calculation of economic values in the sedimentary rocks. Students are able to identify various types of sedimentary rocks and recognize it physically in the laboratory. Students are able to apply the stratigraphy correlations for stratigraphic mapping. Students are also able to understand the economic value of sedimentary rock and able to read and serve stratigraphic map for exploration and development purposes.

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	[C4,P4,A4] Students are able to understand the component and genesis of sedimentary rocks	Introduction to Sedimentary Stratigraphy on mineral composition of sedimentary rock and its genesis [K1] : Component and Genesis of Sedimentary Rocks.ppt	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50")	Discussion (Review on sedimentary rocks component and mineral composition	the accuracy of explaining	
2	[C4,P4,A4] Students are able to understand the texture and structure of sedimentary rocks	Introduction to Sedimentary Stratigraphy of depositions including the texture and structure formed simultaneously with syn-deposition or post-deposition [K2] : Introduction to the Texture and Structure of Sedimentary Rocks.ppt	Direct Lecture, Discussion;	TM: 1x(3x50") [BT+BM:2x(4x60")]	Discussion (textures and structures of sedimentary rocks); **Assignment-K2 : Resume on Component and Genesis of Sedimentary Rocks**	Get to know of Sedimentary Rocks in general	

3	[C4,P4,A4] Students are able to explain the sedimentary rocks deposition environment reviewed from its components including its textures, structures, and minerals.	Introduction to Sedimentary Stratigraphy, sedimentary rock depositional environment [K3] : Introduction to Sedimentary Stratigraphy depositional environment.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion (sedimentary rock depositional environment); **Assignment-K3:Exercise depositional system comprehension through rocks component**	Get to know of sedimentary rock depositional environment	
4	[C4,P4,A4] Students are able to classified sedimentary rock through its components and depositional environment	The concept of sedimentary stratigraphy on a depositional environment [K4] : Introduction to Sedimentary rock depositional environment.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion (sedimentary rock depositional environment); **Assignment-K4 : Make a sedimentary rock classification table**	Get to know of sedimentary rock classification clearly	
5	[C4,P4,A4] Students are able to understand carbonate sedimentary rock	The concept of sedimentary stratigraphy on carbonate sedimentary rock [K5] : Introduction to carbonate sedimentary rock.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion (carbonate sedimentary rock); **Quiz-K5 : Clastic Rock and Carbonate Rocks (components)**	Get to know of carbonate rocks component	

6	[C4,P4,A4] Students are able to understand the genesis of carbonate rocks (differences in clastic rocks genesis)	The concept of sedimentary stratigraphy on carbonate sedimentary rock [K5] : Introduction to carbonate rocks genesis.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion (plate dynamics in geophysics); **Assignment-K6 : carbonate rocks genesis exercises**	Get to know the genesis of carbonate rocks	
7	[C4,P4,A4] Students are able to understand the genesis of sedimentary rocks, the components, textures, structures, minerals, as well as explain the depositional environment and its classification	The concept of sedimentary stratigraphy on clastic and non-clastic rocks [K7] : Resume of sedimentary stratigraphy on clastic and non-clastic rocks.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion (clastic and non-clastic rocks); **Assignment-K7 : differences between clastic and non-clastic rocks exercise**	Get to know the differences between clastic and non-clastic rocks	
8	Evaluasi Tengah Semester						30%
9	[C4,P4,A4] Students are able to understand about stratigraphy and the laws of stratigraphy	Introduction to sedimentary stratigraphy, the principle of stratigraphy [K9] : Introduction to the principle of stratigraphy.ppt	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50”)	Discussion (the principle of stratigraphy);	Get to know the laws of stratigraphy	

10	[C4,P4,A4] Students are able to understand the differences in stratigraphic science (lithostratigraphy, chronostratigraphy, biostratigraphy)	Introduction to lithostratigraphy, chronostratigraphy, and biostratigraphy [K10] : Introduction to advanced stratigraphy.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion (comprehensive knowledge in stratigraphy); **Assignment-K10 : lithostratigraphy, chronostratigraphy, and biostratigraphy exercises**	the accuracy of explaining	5%
11	[C4,P4,A4] Students are able to analyse the correlation of rocks	The basic concept of sedimentary rocks correlations (understand datum/keybed) [K11] : rocks correlation.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion	the accuracy of comparing and explaining	
12	[C4,P4,A4] Students are able to analyse the correlation of rocks (lithocorrelation, chronocorrelation, and biocorrelation)	Comprehension of the differences in lithocorrelation, chronocorrelation, and biocorrelation [K12] : lithocorrelation, chronocorrelation, and biocorrelation.ppt	Direct Lecture, Discussion, Video;	TM: 1x(3x50”)	Discussion **Quiz-K12 : Stratigraphy and Correlation**	the accuracy of explaining	5%

13	[C4,P4,A4] Students are able to read a regional stratigraphy and its use	The basic concept of regional stratigraphy reading [K13] :Regional geology map.ppt	Direct Lecture, Discussion, Video;	TM: 1x(3x50") [BT+BM:2x(4x60")]	Discussion **Assignment -K13 : Practice on simulating the flow in the earth with program language**	the accuracy of explaining	10%
14	[C4,P4,A4] Students are able to understand the sequence stratigraphy	The concept of sequence stratigraphy [K14] : Introduction to Sequence Stratigraphy.ppt	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	the accuracy of explaining	
15	[C4,P4,A4] Students are able to understand a stratigraphy, correlation, and sequence of rocks	Comprehensive understanding of sedimentary stratigraphy [K15] : Journal.ppt	Discussion	TM: 1x(3x50") [BT+BM:2x(4x60")]	Discussion **Assignment-K15 : Presentation and resume about sedimentary stratigraphy**	the accuracy of explaining	
16	End Semester Evaluation						30%

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1. Dunbar,C.O and Rodgers,J (157),Principal Of Stratigraphy
2. Schoch,R.M, (1989), Stratigraphy : Principal and Methods
3. Martodjojo, S dan Djuhaeni, (1996), Sandi Stratigrafi Indonesia
4. Mc Lane,M.,1995,Sedimentology,Oxford University Press Inc.,423 hal.
5. Collinson,JD.,Thompson,DB.,1982,Sedimentary Structures 2nd Ed.,London Unwin Hyman,207 hal.

Program Study	Geophysical Engineering Department
Course	Seismology
Cource Code	RF184309
Semester	III (Three)
Credit	3 (P:2,R:1) SKS
Lecturer	Firman Syaifuddin, S.Si., M.T.

Study materials	Wave, Physics		
Learning Outcome (LO)	Attitude	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.1	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
		3.2	understanding geological knowledge that required to understand the geological process of a particular natural phenomena by its characteristics;

		3.3	understanding the theoretical concept of statistics to define the process complexity of a particular natural phenomena;
		3.4	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
		3.7	understanding the factual insights and technology application methods; codes and national/international standards as well as the regulations in force in his/her work area to carry out geophysical engineering technology work in depth;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.9	being able to recognize the difference between land and sea exploration field characteristics that can be affected into the quality of measurement data;

		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
		4.12	being able to criticize the complete operational procedures in solving the problems of geophysical engineering technology that has been and / or is being implemented, and poured in the form of scientific papers.
LO – Course	[C3,P3,A3] Students can understand phenomena related to earthquake vibrations and are able to explain the concept of earthquake wave propagation. Students are able to determine the location of the earthquake source, the type of the earthquake, and analyze the mechanism of the earthquake. Students can understand the principles and application of the earthquake monitoring equipment. Students can understand the basic concepts of seismology used in exploration.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	[C3, P3,A3] Understand what will be learned in this lecture, understand the basic fundamental of seismology.	1. Introduction to lecture: • Semester learning plans • College contracts • Scoring system 2. Review wave course	Introductory lectures, lecture contract and brainstorm, sharing opinion.	TM: 1x(3x50")	Discussion; Make a summary	Understanding what will be learned in this lecture Able to explain the basic seismology	"5% task"
2	[C3, P3,A3] Understand the concepts of stress and strain that form the basis of the	Stress and strain,	Direct lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to explain the concepts of stress and strain.	"5% task "

	mechanical wave equation.					Able to explain the types of forces on continuous medium.	
3	[C3, P3,A3] Understand wave equations and being able to derive general wave mechanics formulas,	The seismic wave equation,	Direct lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to explain wave equations. Able to derive the general formula pf mechanical wave.	"5% task "
4	[C3, P3,A3] Knowing the concepts of travel times approached by the principle of wave rays.	Ray theory: Travel times,	Direct lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary **Quiz-01**	Able to explain the concept of travel times approached by the principle of wave rays.	"5% task " **15% Quiz**
5	[C3, P3,A3] Able to do inversion of travel time data with the wave ray approach.	Ray theory: Inversion of travel time data,	Direct lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to do inversion of travel time data with the wave ray approach.	"5% task "
6	[C3, P3,A3] Knowing the amplitude and phase which approached by the principle of wave light.	Ray theory:Amplitude and phase,	Direct lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to explain the amplitude and phase which approached by the principle of wave light.	"5% task "

7	[C3, P3,A3] Knowing the concept of reflection that us used in the field of seismology.	Reflection seismology,	Direct lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to explain the concept of reflection used in the field of seismology.	"5% task "
8	Mid Semester Evaluation (Formative Evaluation-Evaluation that is intended to improve the learning process based on the assessment that has been done)						40%
9	**[C3, P3,A3]** Knowing the concept of surface waves and normal modes.	Surface waves and normal modes,	Direct lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to explain the concept of surface waves and normal modes.	"5% task "
10	**[C3, P3,A3]** Knowing the concept of earthquakes and source theory.	Earthquakes and source theory	Direct lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to explain the concepts of earthquake and source theory.	"5% task "
11	[C3, P3,A3] Knowing the concepts of earthquake prediction.	Earthquake prediction,	Direct lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to explain the earthquake prediction.	"5% task "
12	[C3, P3,A3] Knowing the concept of earthquake instruments.	Earthquake Instruments	Direct lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary **Quiz-02**	Able to explain the concept of earthquake instruments.	"5% task "

13	[C3, P3,A3] Knowing the concept of noise and anisotropy.	noise, and anisotropy	Direct lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to explain the concept of noise and anisotropy.	"5% task "
14	[C3, P3,A3] Knowing the concept of volcanic seismology.	Volcanic Seismology	Direct lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to explain the concept of volcanic seismology.	"5% task "
15	[C3, P3,A3] Able to analysis seismology data.	Case study. Study literature from various source.	Group paper presentations; Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to analysis seismology data. Being able to present papers on the result of literature studies. Able to conduct scientific discussions with a question and answer mechanism.	"5% task "
16	Final Semester Evaluation (Evaluation intended to find out the final achievement of student learning outcomes)						40%

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1. Shearer, P. M., 2009, Introduction to Seismology, Cambridge University Press, Cambridge, UK.
2. Zobin, V. M., 2012, Introduction to Volcanic Seismology, Elsevier, London, UK.
3. Jens Havskov, Gerardo Alguacil (auth.)-Instrumentation in Earthquake Seismology-Springer International Publishing (2016)
4. Barbara Romanowicz, Adam Dziewonski-Seismology and Structure of the Earth_ Treatise on Geophysics-Elsevier (2009)
5. Agustin Udías-Principles of Seismology-Cambridge University Press (2000).
6. Thorne Lay, Terry C. Wallace-Modern Global Seismology, Vol. 58-Academic Press (1995
7. V. I. Keilis-Borok (auth.), V. I. Keilis-Borok, Edward A. Flinn (eds.)-Computational Seismology-Springer US (1995)

Program Study	Geophysical Engineering Department
Course	Digital Data Analysis
Cource Code	RF184410
Semester	4 (T:3, R:1) SKS
Credit	IV (Empat)
Lecturer	1. Dr. Ayi Syaeful Bahri, S.Si., M.T. 2. Mariyanto, S.Si., M.T.

Study materials	Mathematics, Progamming, Domain Transformation		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.3	Able to study the implications of the development or implementation of technological science that applies the value of the humanities according to their expertise based on scientific rules, procedures and ethics in order to produce solutions, ideas, designs or art criticisms, compile scientific descriptions of the

			results of their studies in the form of thesis or final project report , and upload it on the college page;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
	Knowledge	3.1	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
		3.5	understanding the concepts, principles and techniques of system design, process or application component of geophysical engineering in procedurally starting from data retrieval, processing, interpretation and modeling to solve the problems of geophysical engineering in depth;
		3.9	Able to master the principles of quality assurance in general in geophysical engineering work;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
LO – Course	[C4,P4.A3] Students are able to analyze the basic concepts of digital signal data in geophysics which includes all the substances in it to support data processing and be able to apply to geophysical data processing, Able to be responsible for the achievement of group work and to supervise and evaluate the completion of work assigned to workers under its responsibilities.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Students are able to explain the concept of signal analysis.	The bacis concepts of signal analysis, signals and system in geophysics, data terminology, information and analysis in geophysics.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion	Liveliness of interact	-
2	Students are able to explain the various type of signals.	Signals classification: Analog signal Digital signal Odd function signal Even function signal Continuous signal Discrete signal Periodic signal Aperiodic signal	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion, task	Task result	2,5%
3	Students are able to do periodic signal analysis in a fourier series.	Periodic signals, Fourier series	Direct Lecture 120 minute Discussion	150 minute	Presentation, discussion	Liveliness of interact	-

			30 minute				
4	Students are able to do aperiodic signal analysis using Fourier integrals.	Fourier analysis, Aperiodic signal, Fourier integral.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion, quiz	Quiz result	5%
5	Students are able to do discrete Fourier data transformation manually.	Discrete fourier data transformation.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion, task	Task result	2,5%
6	Students are able to do fourier data transformation by programming.	Algorithm in Fourier Transform, Fast Fourier Trasnform (FFT)	Kuliah 120 menit Diskusi 30 menit	150 minute	Presentation, discussion	Liveliness of interact	-
7	Students are able understand and apply the Fourier transforms on geophysical data.		Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion	Liveliness of interact	-
8	Mid Semester Evaluation						30%
9	Students are able to understand the relationship between interval sampling with nyquist frequency and cut off.	Sampling function, nyquist theorem, nyquist frequency and cut off, aliasing	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion	Liveliness of interact	-

10	Students are able to convolution data manually.	The physical meaning of convolution, convolution integral, convolution in the time and frequency domains.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion, task	Task result	2,5%
11	Students are able to convolution data by programming.	Convolution properties, convolution programming.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion	Liveliness of interact	-
12	Students are able to correlate data manually.	Integral correlation, cross correlation, autocorrelation.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion, quiz	Quiz result	5%
13	Students are able to convolution data by programming.	correlation characteristics, correlation programming.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion, task	Task result	2,5%
14	Students are able to understand about data filters.	Filter classification, linear filter, nonlinear filter, low pass filter,	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion, demo	Presentation and demo result	20%

		band pass filter, high pass filter					
15	Students are able to filter data.	Correlation for suppressing noise (match filter), programming the data filter.	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, discussion	Liveliness of interact	-
16	End of Semester Evaluation						30%

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1. Clearbout, J.F.; Fundamentals of Geophysical Data Processing With Applications to Petroleum Prospecting. Mc. Graw-Hill Book Co., New York, 1976.
2. Sheriff, R.E., and Geldart, L.P.; Exploration Seismology Vol.2 : Data Processing and Interpretation. Cambridge University Press, 1983.
3. Oram Brigham B.: The Fast Fourier Transform and It's Applications. Prentice-Hall Inc., 1988.

Program Study	Geophysical Engineering
Course	Mineral Deposits
Code	RF184412
Semester	IV (Four)
Credit	3 (T:3) SKS
Lecturer	Dr. Ir. Amien Widodo, M.S.

Study Materials	Geology, Mechanics, Minerals		
Learning Outcome (LO)	Attitude	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;

		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.2	understanding geological knowledge that required to understand the geological process of a particular natural phenomena by its characteristics;
		3.10	understanding the concept and principle of environmental conservation in general from the activities of geophysical engineering;
		3.13	understanding the insight of sustainable development in applied geophysical exploration methods and natural resource management in general;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.11	capable of reading maps and satellite imagery, determining map orientation in the field using GPS, compass and satellite data; and

LO– Course	[C4,P4,A4] Students are able to understand various explorable and exploitable natural resources related to mineral deposits for economic purpose. Understand types of mineral deposits which has economic value and knowing its whereabouts that related to tectonic condition of a geology environment. Understand the process of mineral deposits formed in a certain zones and prediction of its whereabouts in the field (mineral deposits genesis).

Week	The Expected of Sub LO-Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience*	Criteria and Indicators	Weight (%)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	[C4,P4,A4] Students are able to understand structural geology and Earth's constituent components(Earth Structure)	Introduction to Earth Structure [K1] : Earth Structure.ppt	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50")	Discussion (Comprehension of Earth's components from the core to the crust and its relation to structural geology)	the accuracy of explaining	
2	[C4,P4,A4] Students are able to understand crust deformations (Divergent, Convergent, and Transform)	Introduction to Crust Deformation [K2] : Tectonic Deformation Part 1.ppt	Direct Lecture, Discussion;	TM: 1x(3x50") [BT+BM:2 x(4x60")]	Discussion (types of tectonic crust movement); **Assignment-K2 : Resume on divergent, convergent, and transform process**	Get to know of plate movements	

3	[C4,P4,A4] Students are able to explain the difference of Brittle and Ductile	Introduction to Brittle and Ductile on plate crust [K3] : Brittle and Ductile.ppt	Direct Lecture, Discussion;	TM: 1x(3x50") [BT+BM:2 x(4x60")]	Discussion (Brittle and Ductile); **Assignment-K3 :Latihan soal Brittle and Ductile Exercises, the difference of divergent, convergent, and transform**	Get to know the difference of Brittle and Ductile and the outcome structures from both	
4	[C4,P4,A4] Students are able to analyse the kinematics and dynamics of plate movement	The concept of kinematics and dynamics in structural geology [K4] : Force Kinematics.ppt	Direct Lecture, Discussion;	TM: 1x(3x50") [BT+BM:2 x(4x60")]	Discussion (Dynamics of Tectonic Plate); **Assignment-K4 : Resume of Plate Movement Kinematics**	Get to know the various types of plate movement from the dynamics of its kinematic force	
5	[C4,P4,A4] Students are able to understand carbonate sedimentary rock	The concept of sedimentary stratigraphy on carbonate sedimentary rock [K5] : Introduction to carbonate sedimentary rock.ppt	Direct Lecture, Discussion;	TM: 1x(3x50") [BT+BM:2 x(4x60")]	Discussion (carbonate sedimentary rock); **Quiz-K5 : Clastic Rock and Carbonate Rocks (components)**	Get to know of carbonate rocks component	

6	[C4,P4,A4] Students are able to understand the genesis of carbonate rocks (differences in clastic rocks genesis)	The concept of sedimentary stratigraphy on carbonate sedimentary rock [K5] : Introduction to carbonate rocks genesis.ppt	Direct Lecture, Discussion;	TM: 1x(3x50") [BT+BM:2 x(4x60")]	Discussion (plate dynamics in geophysics); **Assignment-K6 : carbonate rocks genesis exercises**	Get to know the genesis of carbonate rocks	
7	[C4,P4,A4] Students are able to understand the genesis of sedimentary rocks, the components, textures, structures, minerals, as well as explain the depositional environment and its classification	The concept of sedimentary stratigraphy on clastic and non-clastic rocks [K7] : Resume of sedimentary stratigraphy on clastic and non-clastic rocks.ppt	Direct Lecture, Discussion;	TM: 1x(3x50") [BT+BM:2 x(4x60")]	Discussion (clastic and non-clastic rocks); **Assignment-K7 : differences between clastic and non-clastic rocks exercise**	Get to know the differences between clastic and non-clastic rocks	
8	Mid Semester Evaluation						30%
9	[C4,P4,A4] Students are able to understand about stratigraphy and the laws of stratigraphy	Introduction to sedimentary stratigraphy, the principle of stratigraphy [K9] : Introduction to the principle of stratigraphy.ppt	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50")	Discussion (the principle of stratigraphy);	Get to know the laws of stratigraphy	

10	[C4,P4,A4] Students are able to understand the differences in stratigraphic science (lithostratigraphy, chronostratigraphy, biostratigraphy)	Introduction to lithostratigraphy, chronostratigraphy, and biostratigraphy [K10] : Introduction to advanced stratigraphy.ppt	Direct Lecture, Discussion;	TM: 1x(3x50") [BT+BM:2 x(4x60")]	Discussion (comprehensive knowledge in stratigraphy); **Assignment-K10 : lithostratigraphy, chronostratigraphy, and biostratigraphy exercises**	the accuracy of explaining	5%
11	[C4,P4,A4] Students are able to analyse the correlation of rocks	The basic concept of sedimentary rocks correlations (understand datum/keybed) [K11] : rocks correlation.ppt	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	the accuracy of comparing and explaining	
12	[C4,P4,A4] Students are able to analyse the correlation of rocks (lithocorrelation, chronocorrelation, and biocorrelation)	Comprehension of the differences in lithocorrelation, chronocorrelation, and biocorrelation [K12] : lithocorrelation, chronocorrelation, and biocorrelation.ppt	Direct Lecture, Discussion, Video;	TM: 1x(3x50")	Discussion **Quiz-K12 : Stratigraphy and Correlation**	the accuracy of explaining	5%
13	[C4,P4,A4] Students are able to read a regional stratigraphy and its use	The basic concept of regional stratigraphy reading	Direct Lecture, Discussion, Video;	TM: 1x(3x50") [BT+BM:2 x(4x60")]	Discussion **Assignment -K13 : Practice on simulating the**	the accuracy of explaining	10%

		[K13] :Regional geology map.ppt			**flow in the earth with program language**		
14	[C4,P4,A4] Students are able to understand the sequence stratigraphy	The concept of sequence stratigraphy [K14] : Introduction to Sequence Stratigraphy.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion	the accuracy of explaining	
15	[C4,P4,A4] Students are able to understand a stratigraphy, correlation, and sequence of rocks	Comprehensive understanding of sedimentary stratigraphy [K15] : Journal.ppt	Discussion	TM: 1x(3x50”) [BT+BM:2 x(4x60”)]	Discussion **Assignment-K15 : Presentation and resume about sedimentary stratigraphy**	the accuracy of explaining	
16	End Semester Evaluation						30%

REFERENCES :

1. Pirajno, F, (1990), Hydothermal Mineral Deposits, Springer Verlag.
2. Pirajno, F, 2009. Hydrothermal Processes and Mineral Systems. Springer Verlag, 1250 p.
3. Roberts, RG & Sheahan, PA, (1988), Ore Deposit Models, Geological Association of Canada.
4. Guilbert, JM & Park, Jr. CF., (1986) The Geology of Ore Deposits, Freeman, NY.

Program Study	Geophysical Engineering Department
Course	Geostatistics
Course Code	RF184413
Semester	IV (Four)
Credit	3 SKS
Lecturer	1. Anik Hilyah, S.Si., M.T. 2. M.Singgih Purwanto, S.Si., M.T.

Study Materials	Basic statistical theory, conventional and unconventional geostatistical methods, analysis and modeling of variograms, variogram shapes, dispersion variances, estimation variances, krigging, reserve estimation, reservoir characterization and practicum using geostatistical software.		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;

		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.1	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
		3.3	understanding the theoretical concept of statistics to define the process complexity of a particular natural phenomena;
		3.5	understanding the concepts, principles and techniques of system design, process or application component of geophysical engineering in procedurally starting from data retrieval, processing, interpretation and modeling to solve the problems of geophysical engineering in depth;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
LO - Course	[C4,P3,A3] Students are able to estimate the volume deviation and reservoir characterization using the geostatistical method.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Able to know the geostatistical application.	▪ Introduction to geostatistics	Direct Lecture and Discussion	150 minute	Discussion	Students are able to know the application of	

		▪ Geostatistical applications in mining and reservoir characterization ▪ Univariate Statistics				geostatistics in data processing and interpretation.	
2	Able to know conventional backup calculation methods.	▪ Polygon Method ▪ Nearest point method ▪ Block method	Direct Lecture and Discussion	150 minute	Discussion	Students are able to apply various conventional backup calculation methods.	
3	Able to understand geostatistical reserve calculation methods.	▪ Normal distribution ▪ Data stationarity	Direct Lecture and Discussion	150 minute	Discussion	Students are able to apply various geostatistical reserve calculation methods.	
4	Quiz 1 (Formative Evaluation-Evaluation which is intended to improve the learning process based on the assessment that has been done)						15%
5	Able to understand semivariograms.	▪ Sill, nuggets and range ▪ Theoretical Variogram ▪ Experimental variogram	Direct Lecture and Discussion	150 minute	Presentation, discussion, task	Students are able to make semivariograms, theoretical and experimental variograms.	10%

6	Able to understand the variogram model.	▪ Variogram behavior near the starting point ▪ Variogram model	Direct Lecture and Discussion	150 minute	Presentation, discussion	Students are able to analyze the variogram shape.	
7	Able to understand geometry support.	▪ Pengaruh support geometri ▪ Anisotropi	Direct Lecture and Discussion	150 minute	Presentation, discussion, Practicum	Students are able to determine the geometry support according to the data.	20%
8	Mid Semester Evaluation (Formative Evaluation-Evaluation which is intended to improve the learning process based on the assessment that has been done)						20%
9	Able to understand extension variance.	▪ Calculation of variance extension ▪ Application variance extension	Direct Lecture and Discussion	150 minute	Presentation, discussion	Students are able to apply extension variance.	
10	Able to understand the estimated variance.	▪ Calculation of estimated variance ▪ Application of estimation variance	Direct Lecture and Discussion	150 minute	Presentation, discussion	Students are able to apply the estimated variance.	
11	Able to understand Kriging variance.	▪ Calculation of Kriging variance	Direct Lecture and Discussion	150 minute	Presentation, discussion	Students are able to calculate the Kriging variance.	

		▪ Kriging variance application					
12	Able to understand reserve estimates.	▪ Calculation of estimated reserves	Direct Lecture and Discussion	150 minute	Presentation, discussion	Students are able to calculate reserve estimates.	
13	Quiz 2 (Formative Evaluation-Evaluation which is intended to improve the learning process based on the assessment that has been done)proses pembelajaran berdasarkan assessment yang telah dilakukan			150 minute			15%
14	Able to understand geostatistical case studies for reserve calculations.	Geostatistical case studies on mining.	Direct Lecture and Discussion	150 minute	Presentation, discussion, task	Students are able to solve geostatistical problems in mining.	
15	Able to understand geostatistical case studies for reservoir characterization	Geostatistical case study on reservoirs	Direct Lecture and Discussion	150 minute	Presentation, discussion	Students are able to solve geostatistical problems in reservoir characterization.	
16	End of Semester Evaluation (Formative Evaluation-Evaluation which is intended to improve the learning process based on the assessment that has been done)						20%

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1. David, M., "Geostatistical Ore Reserve Estimation, Developments in Geomathematics 2", Elsevier Scientific Publishing Co., Amsterdam, Oxford-New York, 1980 Matheron, G., "Principles of Geostatistics", Economic Geology vol.58, 1963
2. Annels, Alwyn E., "Mineral Deposit Evaluation", A practical approach, Chapman dan Hall, London, 1991.
3. Wellmer, Friedrich, Statistical Evaluations in Exploration for Mineral Deposits, Springer, Germany, 1998
4. Journel, A.G. dan C. Huijbregts, "Mining Geostatistics", Academic Press, 1978
5. Rendu, J.M., "An Introduction to Geostatistical Methods of Mineral Evaluation", Monograph of the South African Inst. Min. Metall., 1978

Program Study	Geophysical Engineering Department
Course	Geodynamics
Course Code	RF184414
Semester	IV (Four)
Credit	3 (T:3) SKS
Lecturer	1. Wien Lestari, S.T., M.T. 2. Nita Aryanti, S.T., M.Eng.

Study Materials	Geology, Mechanics		
Learning Outcome (LO)	Attitude	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.2	understanding geological knowledge that required to understand the geological process of a particular natural phenomena by its characteristics;
		3.3	understanding the theoretical concept of statistics to define the process complexity of a particular natural phenomena;
		3.8	understanding the principle and methods of mapping application that required in general geophysical engineering work;
		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
		3.13	understanding the insight of sustainable development in applied geophysical exploration methods and natural resource management in general;

	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.9	being able to recognize the difference of land and sea exploration field characteristics that can be affected into the quality of measurement data;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
		4.11	capable of reading maps and satellite imagery, determining map orientation in the field using GPS, compass and satellite data; and
		4.12	being able to criticize the complete operational procedures in solving the problems of geophysical engineering technology that has been and / or is being implemented and poured in the form of scientific papers.

LO - Course	[C4,P4,A4] Students are able to apply physics law into plate dynamics which includes the process and the products among others are earthquake, landslide, mountain formation, and the change in coastal line. Students are able to understand the basics of Brittle and Ductile from lithosphere, able to explain the relation between the events and appearance which is revealed in the field, also able to understand the geophysics calculations on the basis of continental or oceanic crust emergence and Earth dynamics.

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	2	3	4	5	6	7	8
1	[C4,P4,A4] Students are able to understand the basics of plate crust which includes the brittle (rigid) and ductile (non-rigid)	Introduction to geodynamics on the basics of the Earth's plate crust consists of the rigid part and non-rigid part along with its movement [K1] : Introduction to Geodynamics of Plate Crust.ppt	Introductory Lecture, lecture contract and brainstorming	TM: 1x(3x50")	Discussion (Review on the basics of plate crust and its movement);	The accuracy of explaining	5%
2	[C4,P4,A4] Students are able to understand the basics of geophysical calculations from plate tectonics started from	Introduction to geodynamics for geophysics, plate tectonic, and mathematical	Introductory Lecture, brainstorming	TM: 1x(3x50") [BT+BM:2x(4x60")]	Discussion (plate dynamics in geophysics);	Get to know the general formula of plate dynamics	10%

	the concept of continental drift and seafloor spreading.	equation for plate dynamics [K9] : Introduction to geodynamics for geophysics.ppt			**Assignment-K10 : Plate dynamics and isostasy exercises**		
3	[C4,P4,A4] Students are able to understand the basics of geophysical calculations from plate tectonics started from the concept of continental drift and seafloor spreading.	Introduction to geodynamics for geophysics, plate tectonic, and mathematical equation for plate dynamics [K9] : Introduction to geodynamics for geophysics.ppt	Introductory Lecture, brainstorming	TM: 1x(3x50") [BT+BM:2x(4 x60")]	Discussion (plate dynamics in geophysics); **Assignment-K10 : Plate dynamics and isostasy exercises**	Get to know the general formula of plate dynamics	10%
4	[C4,P4,A4] Students are able to understand the basics of geophysical calculations from plate tectonics started from the concept of continental drift and seafloor spreading.	Introduction to geodynamics for geophysics, plate tectonic, and mathematical equation for plate dynamics [K9] : Introduction to geodynamics for geophysics.ppt	Introductory Lecture, brainstorming	TM: 1x(3x50") [BT+BM:2x(4 x60")]	Discussion (plate dynamics in geophysics); **Assignment-K10 : Plate dynamics and isostasy exercises**	Get to know the general formula of plate dynamics	10%

5	[C4,P4,A4] Students are able to understand the basics of geophysical calculations from plate tectonics started from the concept of continental drift and seafloor spreading.	Introduction to geodynamics for geophysics, plate tectonic, and mathematical equation for plate dynamics [K9] : Introduction to geodynamics for geophysics.ppt	Introductory Lecture, brainstorming	TM: 1x(3x50") [BT+BM:2x(4 x60")]	Discussion (plate dynamics in geophysics); **Assignment-K10 : Plate dynamics and isostasy exercises**	Get to know the general formula of plate dynamics	10%
6	[C4,P4,A4] Students are able to understand the basics of geophysical calculations from plate tectonics started from the concept of continental drift and seafloor spreading.	Introduction to geodynamics for geophysics, plate tectonic, and mathematical equation for plate dynamics [K9] : Introduction to geodynamics for geophysics.ppt	Introductory Lecture, brainstorming	TM: 1x(3x50") [BT+BM:2x(4 x60")]	Discussion (plate dynamics in geophysics); **Assignment-K10 : Plate dynamics and isostasy exercises**	Get to know the general formula of plate dynamics	10%

7	[C4,P4,A4] Students are able to understand the basics of geophysical calculations from plate tectonics started from the concept of continental drift and seafloor spreading.	Introduction to geodynamics for geophysics, plate tectonic, and mathematical equation for plate dynamics [K9] : Introduction to geodynamics for geophysics.ppt	Introductory Lecture, brainstorming	TM: 1x(3x50") [BT+BM:2x(4 x60")]	Discussion (plate dynamics in geophysics); **Assignment-K10 : Plate dynamics and isostasy exercises**	Get to know the general formula of plate dynamics	10%
8	Mid Semester Evaluation						30%
9	[C4,P4,A4] Students are able to understand the basics of geophysical calculations from plate tectonics started from the concept of continental drift and seafloor spreading.	Introduction to geodynamics for geophysics, plate tectonic, and mathematical equation for plate dynamics [K9] : Introduction to geodynamics for geophysics.ppt	Introductory Lecture, brainstorming	TM: 1x(3x50")	Discussion (plate dynamics in geophysics); **Assignment-K10 : Plate dynamics and isostasy exercises**	Get to know the general formula of plate dynamics	

10	[C4,P4,A4] Students are able to understand continental dynamics and deformation between plates with geophysics (gravity and isostasy)	Introduction to deformation, the basic concept of gravity and plate isostasy [K10] : Introduction to gravity and isostasy.ppt	Direct Lecture, Discussion;	TM: 1x(3x50") [BT+BM:2x(4 x60")]	Discussion (plate dynamics in geophysics); **Assignment-K10 : Plate dynamics and isostasy practice**	the accuracy of explaining	5%
11	[C4,P4,A4] Students are able to analyse stress and strain	The concept and measurement of stress and strain [K11] : deformation, stress and strain.ppt	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	the accuracy of explaining and comparing	
12	[C4,P4,A4] Students are able to understand the basic rheology	The basic concept and measurement of rheology [K12] : Introduction to rheology.ppt	Direct Lecture, Discussion, Video;	TM: 1x(3x50")	Discussion **Quiz-K12 :stress and strain**	the accuracy of explaining	5%

13	[C4,P4,A4] Students are able to understand the concept of hotspot formation/volcanism and its relation to the plate movement, tectonic plume, fluid mechanics	The basic concept of fluid mechanics and volcanism [K13] : Introduction to fluid mechanics and volcanism.ppt	Direct Lecture, Discussion, Video;	TM: 1x(3x50") [BT+BM:2x(4 x60")]	Discussion **Assignment-K13 : Practice in making a language program for flow simulation in the Earth**	the accuracy of explaining	10%
14	[C4,P4,A4] Students are able to understand the principle of heat transfer occurrence/ whole mantle convection	Heat transfer concept [K14] : Introduction to heat transfer.ppt	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	the accuracy of explaining	
15	[C4,P4,A4] Students are able to understand the study case of Geodynamics through Geophysics	Study case comprehension in geodynamics through geophysics [K15] : Journal.ppt	Discussion;	TM: 1x(3x50") [BT+BM:2x(4 x60")]	Discussion **Assignment-K15 :Presentation and resume study geodynamics in geophysics**	the accuracy of explaining	
16	End Semester Evaluation						30%

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1. Thomson and Turk, 2007, Physical Geology, Sounders Golden series
2. Wilson, T. et al., "Physics and Geology", McGraw-Hill, 1975
3. Dana's Manual of Mineralogy, John Wiley and Sons, Inc., New York
4. Turcotte, D.L. and Schubert, G., 1982, Geodynamics : Applications of Continuum physics to geological problems, John Willey & Sons. Inc
5. Blatt, H., Tracy, R.J., Owens, B.R., 2006,Petrology: Igneous, Sedimentary, and Metamorphic,3 rd

Program Study	Geophysical Engineering Department
Course	Rock Mechanics
Cource Code	RF184415
Semester	IV (Four)
Credit	3 (T:2,P:1) SKS
Lecturer	1. Dr.Dwa Desa Warnana, M.Si. 2. Wien Lestari, S.T., M.T.

Study materials	Geology, Mechanics

Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.4	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
		3.12	understanding the concept, principle, workshop procedure, studio and laboratory activities, and Health and Safety Environment (HSE) in general;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;

		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
LO – Course	[C4,P4,A4] Students can explain the concept and solve the basic problems of rock mechanics systems in an integrated and comprehensive for engineering applications.		

Week	**The Expected of Sub LO - Course**	**Learning Subject**	**Learning Methods**	**Time Estimation**	**Student's Learning Experience**	**Criteria and Indicators**	**Weight (%)**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	[C4,P4,A4] Students are able to understand the basics of rock and rock mechanics.	Rock and rock mechanics, scope and problems	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50")	Discussion;	Accuracy of explanation	5%
2	[C4,P4,A4] Students are able to understand stress and strain analysis.	Introduction to stress and strain analysis	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50") [BT+BM:2x(4x60")]	Discussion (plate dynamics in geophysics); **: Exercises**	Accuracy of explanation	10%
3	[C4,P4,A4] Students are able to understand the stress analysis in fields, Mohr circle	Strain analysis	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50") [BT+BM:2x(4x60")]	Discussion **Task-K10 : Exercises**	Accuracy of explanation	10%

4	[C4,P4,A4] Students are able to understand strain analysis.	Introduction to strain analysis	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion **Task-K10 : Exercises**	Accuracy of explanation	10%
5	[C4,P4,A4] Students are able to understand the physical and mechanical properties of rocks in the laboratory.	Physical and mechanical properties of rocks	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion **Task-K10 : Exercises**	Accuracy of explanation	10%
6	[C4,P4,A4] Students are able to understand the determination of mechanical properties in situ. Rock Behavior; Elastic, elastoplastic, rock creep, rock relaxation, stress and strain relations for linear and isotropic elastic behavior.	Determination of mechanical properties in situ. Rock Behavior; Elastic, elastoplastic, rock creep, rock relaxation, stress and strain relations for linear and isotropic elastic behavior.	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion **Task-K10 : Exercises**	Accuracy of explanation	10%
7	[C4,P4,A4] Students are able to understand the basics of rock "Failure" Criteria; Mohr Theory, Mohr-Coulomb Criteria,	"Failure" criteria for rocks; Mohr Theory, Mohr-Coulomb Criteria, Criteria for	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion **Task-K10 : Exercises**	Accuracy of explanation	10%

	Criteria for maximum tensile stress.	maximum tensile stress.					
8	Mid Semester Evaluation						30%
9	[C4,P4,A4] Students are able to understand the maximum shear stress criteria.	Maximum shear stress criteria.	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50")	Discussion (plate dynamics in geophysics);	Get to know the general formula of plate dynamics	
10	[C4,P4,A4] Students are able to understand in situ stress measurements in rock masses;	Measurement of in situ stresses in rock mass;	Direct Lecture, Discussion;	TM: 1x(3x50") [BT+BM:2x(4x60")]	Discussion (plate dynamics in geophysics); **Task-K10 : Exercises about plate dynamics and isostation**	Accuracy of explanation	5%
11	[C4,P4,A4] Students are able to analyze the Rosette deformation Method,	Concept and measurement of Rosette deformation method, [K11]: deformation, stress and strain.ppt	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	The accuracy of comparing and explaining	
12	[C4,P4,A4] Students are able to understand the Flat Jack method,	Basic concepts and rheological calculations	Direct Lecture, Discussion, Video;	TM: 1x(3x50")	Discussion **Quiz-K12 :stress and strain**	Accuracy of explanation	5%

	the over coring method,	[K12]: Introduction to rheology.ppt					
13	[C4,P4,A4] Students are able to understand Hydraulic fracturing.	Basic concepts of fluid mechanics and volcanism [K13]: Introduction to fluid mechanics and volcanism. ppt	Direct Lecture, Discussion, Video	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion **Task-K13 : Exercises making the script of flow simulation in the earth**	Accuracy of explanation	10%
14	[C4,P4,A4] Students are able to understand the technical classification of rock masses;	Technical classification of rock masses;	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion	Accuracy of explanation	
15	[C4,P4,A4] Students are able to understand the important factors in rock classification, rock mass properties, rock mass classification.	Understanding important factors in rock classification, rock mass properties, rock mass classification	Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion **Task-K15 : Presentation and resume of geodynamic studies in geophysics**	Accuracy of explanation	
16	End Semester Evaluation						30%

REFERENCES :

1.Telford, W., Geldart, L.P., and Sheriff, R. E. (1976). Applied Geophysics.Cambridge Univ Press, Cambridge.

2. Goodman, R. E. (1980). Introduction to Rock Mechanics. J. Wiley and Sons, New York 3. Wiley, D. C. and Mah, C. W. (1980). Rock Slope Engineering 4. Derski, W., Izbicki, R., Kisiel, I., and Mroz, Z. (1989). Rock and Soil Mechanics. Elsevier 5. Jurnal Geofisika, Sedimentary, and Metamorphic,3 rd

Program Study	Geophysical Engineering Department
Course	Geoelectrical Exploration
Cource Code	RF184516
Semester	V (Five)

Credit	4 (T:2,P:2) SKS
Lecturer	1. Dr.Dwa Desa Warnana, S.Si., M.Si. 2. Wien Lestari, S.T.,M.T.

Study materials	Electricity, Physics		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.4	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
		3.5	understanding the concepts, principles and techniques of system design, process or application component of geophysical engineering in procedurally starting from data retrieval, processing, interpretation and modeling to solve the problems of geophysical engineering in depth;
		3.6	understanding the complete operational knowledge related to the field of geophysical engineering technology;
		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;

		3.12	understanding the concept, principle, workshop procedure, studio and laboratory activities, and Health and Safety Environment (HSE) in general;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.9	being able to recognize the difference of land and sea exploration field characteristics that can be affected into the quality of measurement data;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
		4.11	capable of reading maps and satellite imagery, determining map orientation in the field using GPS, compass and satellite data; and

		4.12	mampu mengkritisi prosedur operasional lengkap dalam penyelesaian masalah teknologi rekayasa geofisika yang telah dan/atau sedang diterapkan, dan dituangkan dalam bentuk kertas kerja ilmiah.
LO – Course	[C4,P3,A3] Students are able to apply geophysical exploration methods, combine geophysical and geological data to produce accurate interpretations alaso have skills in geological and geophysical field surveys.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	[C4,P4,A4] [Conceptual knowledge, Analyze] Students are able to understand the geoelectric method and its development	Introduction to the geoelectric method, the development of geoelectric methods and general applications [K1]: Introduction to the Geoelectric Method.ppt	Introductory Lecture, contract and brainstorming;	TM: 1x(4x50")	Discussion **Task-K1 : Resume of the development of the Geoelectric method**	Get to know geoelectrical applications in general;	5%

2	[C4,P4,A4][Conceptual knowledge, Analyze]: Able to explain the theoretical concepts of geoelectric methods and relation to the equation electric waves that spread in the earth, the nature of electricity material and rock	Basic concepts and principles of the Geoelectric Method	Direct Lecture, Discussion;	TM: 1x(4x50”);	Discussion	Accuracy of explanation	
3	[C4,P4,A4][Conceptual knowledge, Analyze]: able to understand the concepts and principles of electrode configuration and the process of acquisition (data collection) in the Geoelectric Method	Electrode configuration and application	Direct Lecture, Discussion;	TM: 1x(4x50”); [BT+BM:2x(4x60”)]	Discussion	The accuracy of comparing and explaining	
4	[C4,P4,A4][Conceptual knowledge, Analyze]: able to understand the concepts, modeling principles to solve geophysical engineering problems; 1D and 2D modeling	Concepts, 1D and 2D modeling principles	Direct Lecture, Discussion;	[TM: 1x(4x50”)]	Quiz-K4: Basic geoelectric concepts, data processing stages and general modeling	Accuracy of explanation	5%

5	[C4,P4,A4][Conceptual knowledge, Analyze]: Able to explain the theoretical concepts of resistivity methods, mastering data collection techniques (acquisition)	Concepts, principles and acquisition of resistivity methods	Direct Lecture, Discussion; audio video, *case study*	[TM: 1x(4x50")]	Discussion	Understand the principle of resistivity data acquisition	
6	[C4,P4,A4][Procedural knowledge, Analyze]: Able to choose resources and utilize data design and analysis resistivity method based on information and computational technology appropriate in resistivity method data processing activities;	1D and 2D resistivity data acquisition	Direct Lecture, Team discussion, Practicum	[TM: 1x(4x50")]	Direct Lecture, Team discussion, Field Practicum	Understand how resistivity tools work	
7	[C4,P4,A4][Procedural knowledge, Analyze]: Able to improve the quality of resistivity data through analysis, interpretation of data following the procedures and standards of	1D and 2D resistivity data processing	Direct Lecture, Team discussion, Practicum	[TM: 1x(4x50")] [BT+BM:2x(4x60")]	Discussion **Task-K7:** **1. Understand resistivity data processing software** **2. Processing 1D and 2D resistivity data**	Able to apply software in 1D and 2D resistivity data and analyze the results of data processing.	10%

	geophysical exploration activities by taking into the geological rules and exploration objectives; recognize differences in the characteristics of terrestrial and marine exploration fields that can affect the quality of measurement data;						
8	Mid Semester Evaluation						30%
9	[C4,P4,A4][Procedural knowledge, Analyze]: mastering the concepts, principles and techniques of 1D and 2D modeling in the resistivity method	The concept of 1D and 2D resistivity data modeling principles	Direct Lecture, Class discussion, Practicum	[TM: 1x(4x50")] [BT+BM:2x(4x60")]	Discussion and Practicum **Task K-9; 1D and 2D modeling and interpretation**	Able to apply modeling data in resistivity	20%
10	[C4,P4,A4][Conceptual knowledge, Analyze]: Able to explain the theoretical concepts of the Self Potential method, mastering data collection techniques (acquisition)	The concept of the principle of self potential method	Direct Lecture, Class discussion,	[TM: 1x(4x50")]	Discussion	Accuracy of explanation	
11	[C4,P4,A4][Procedural knowledge, Analyze]:	Acquisition data of self-potential	Direct Lecture, Team discussion, Practicum	[TM: 1x(4x50")]	Team discussion and Practicum	Able to understand the function of	

	Able to choose resources and make use of the data potential design and analysis tools based on information technology and computation that are appropriate in the Self Potential method of data processing activities;	methods, introduction of tools and software				tools and software used in processing Self-Potential data	
12	[C4,P4,A4][Procedural knowledge, Analyze]: Able to improve the quality of Self Potential data through analysis, interpretation of data following the procedures and standards of geophysical exploration activities by taking into the geological rules and exploration objectives; recognize differences in the characteristics of terrestrial and marine exploration fields that	Processing and modeling of Self Potential data	Direct Lecture, Team discussion, Practicum	[TM: 1x(4x50")] [BT+BM:2x(4x60")]	Team discussion and Practicum: **Self Potential data processing**	Understand how to process data and improve the quality of Self Potential data	

	can affect the quality of measurement data;						
13	[C4,P4,A4][Procedural knowledge, Analyze]: Able to choose resources and utilize data design and analysis tools based on information and computational technology based on the Induced Polarization method;	Acquisition data of Induced Polarization method, introduction of tools and software	Direct Lecture, Team discussion, Practicum	[TM: 1x(4x50")] [BT+BM:2x(4x60")]	Team discussion and Practicum	Able to understand the function of tools and software used in data processing Induced Polarization	
14	[C4,P4,A4][Procedural knowledge, Analyze]: Able to improve the quality of Induced Polarization data through analysis, interpretation of data following the procedures and standards of geophysical exploration activities by taking into the principles of geology and exploration objectives;	Induced Polarization data processing and modeling	Direct Lecture, Team discussion, Practicum	[TM: 1x(4x50")] [BT+BM:2x(4x60")]	Team discussion and Practicum: **Induced Polarization data processing**	Understand how to process data and improve the quality of Induced Polarization data	

15	[C4,P4,A4][Procedural knowledge, Analyze]: mastering the concepts, principles and modeling techniques of Self Potential and Induced Polarization methods	The conceptual principles of Self Potential and Induced Polarization data modeling	Direct Lecture, Team discussion, Practicum	[TM: 1x(4x50")] [BT+BM:2x(4x60")]	Discussion and Practicum **Task K-15; 1D and 2D modeling and interpretation**	Modeling data in Self Potential and Induced Polarization	
16	End Semester Evaluation						30%

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1. Telford, WM; Geldart, L.P; Sheriff, RE, 1998, Applied Geophysics, Cambridge Univ Press, Cambridge.
2. Zhdanov, M. S., Keller, G. V., The Geoelectrical Methods in Geophysical Exploration, Elsevier, 1994
3. Jurnal Geofisika

Program Study	Geophysical Engineering Department
Course	Seismic Exploration
Cource Code	RF184517
Semester	V (Five)
Credit	4 (T:3, P:1) SKS
Lecturer	Firman Syaifuddin, S.Si., M.T.

Study materials	Wave, Geology		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.1	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to

			analyse and design system, process, product, or component in geophysics engineering in deep;
		3.2	understanding geological knowledge that required to understand the geological process of a natural phenomenon by its characteristics;
		3.3	understanding the theoretical concept of statistics to define the process complexity of a natural phenomenon;
		3.5	understanding the concepts, principles and techniques of system design, process or application component of geophysical engineering in procedurally starting from data retrieval, processing, interpretation and modeling to solve the problems of geophysics engineering in deep;
		3.6	understanding the complete operational knowledge related to the field of geophysical engineering technology;
		3.8	understanding the principle and methods of mapping application that required in general geophysical engineering work;
		3.9	mastering the principles of quality assurance in general in geophysics engineering work;
		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
		3.11	mastering factual knowledge of current principles and issues in economic, socio-cultural and ecological issues in general that have an influence on the field of geophysics engineering;

		3.14	mastering general concepts, principles, and techniques of effective communication orally and in writing for specific purposes in general; and
		3.15	mastering factual knowledge about the development of cutting-edge technology and advanced materials in the field of geophysical engineering in deep
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.3	being able to conduct research that includes identification, formulation, and analysis of geophysical engineering problems;
		4.4	being able to formulate alternative solutions to solve complex geophysical engineering problems by considering economic, health, public safety, cultural, social and environmental factors;
		4.5	being able to design systems, processes, and components with an analytical approach and consider technical standards, aspects of performance, reliability, ease of application, sustainability and pay attention to economic, health and public safety, cultural, social and environmental factors;

		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.9	being able to recognize the difference of land and sea exploration field characteristics that can be affected into the quality of measurement data;
LO – Course	[C3,P3,A3] Students can understand the basic concepts of physics related to seismic wave propagation, Students must have knowledge of "seismic exploration", history, development and technology and terminology, students can understand the seismic refraction and reflection methods, students have an understanding of data processing techniques 2D seismic refraction and reflection.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	[C4, P3,A3] [Conceptual knowledge, Analyze]: Able to understand the history of technological	"1. Introduction to Lecture: • Semester Learning Plans • College Contracts • Scoring system	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50")	Discussion; Make a summary	• Understanding what will be learned in this course • Understanding the history of technological	"5% Task"

	development of seismic methods in exploration activities,	Introduction to Lecture The history of seismic exploration "Main literature - chapter 1				development of seismic methods in exploration activities	
2	[C3, P3,A3] Knowing the basic concepts of seismic wave mechanism and seismic wave propagation. Able to explain the wave equation.	"a) Stress and strain b) The seismic wave equation c) Basic wave propagation" Supporting literature 1 - chapters 2 & 3 Supporting literature 2 - chapter 2 Practicum Module-01 "	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	• Knowing the basic concepts of seismic wave mechanism • Knowing the basic concepts of seismic wave propagation, • Able to explain the wave equation.	"5% Task"
3	[C4, P3,A3] Understanding the concept of ray theory, Understanding the concept of time of wave propagation, Able to reduce Snell's law equation in the boundary line,	"a) Ray theory & Travel times b) Snell's law & Asymptotic ray theory c) Rays at an interface & Boundary conditions d) Continuity of the ray equations "Supporting literature 1 - chapter 4	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	• Understanding the concept of ray theory, • Understanding the concept of the time of wave propagation, • Being able to reduce Snell's law equation in the boundary line and know the concepts	"5% Task"

		Supporting literature 2 - chapters 5 & 6 Practicum Module-02 "				of reflection and transmission of seismic waves,	
4	[C3, P3,A3] Knowing the concept of reflection and seismic wave transmission, Knowing the concept of acoustic wave propagation in Isotropic and Anisotropic media	e)Reflection/transmission coefficients & Free surface reflection coefficients f) Fluid–solid reflection/transmission coefficients g) Interface polarization conversions h) Linearized coefficients & Geometrical Green dyadic with interfaces " "Supporting literature 1 - chapter 4 Supporting literature 2 - chapters 5 & 6 Practicum Module-02 "	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary **Quiz-01**	Knowing the concept of acoustic wave propagation in Isotropic and Anisotropic media	"5% Task" 15% Quiz
5	[C4, P3,A3] Understanding the concept of seismic wave geometry both reflection and	"Seismic wave geometry • Reflection path • Refraction path • Vertical velocity gradient	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Understanding the concept of seismic wave geometry both reflection and refraction,	"5% Task"

	refraction, Understanding the vertical velocity gradient phenomenon.	"Main literature - chapters 4, 5 & 6 Practicum Module-03”				Understanding the vertical velocity gradient phenomenon.	
6	[C4, P3,A3] Understanding the concept of seismic wave velocity theoretically and be able to experiment with seismic wave velocity data, able to distinguish the types of seismic events and their characteristics.	Seismic wave velocity • Seismic sedimentary rock models • Speed data experimentation • Application of the concept of speed • Speed measurement Characteristics of seismic events • Reflection • Events other than reflection • Resolution • Attenuation "Main literature - chapters 4, 5 & 6 Practicum Module-03 "	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Understanding the concept of seismic wave velocity theoretically and be able to experiment with seismic wave velocity data Being able to distinguish the types of seismic events and their characteristics.	"5% Task"
7	[C3, P3,A3] Understanding the basic concepts of the seismic refraction	• The basic concept of the seismic refraction method • Survey design and measurement of	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Understanding the basic concepts of the seismic refraction method.	"5% Task"

	method. Able to make refraction seismic survey design, Able to do refraction seismic data processing, able to interpret refraction seismic data and make subsurface modeling based on refraction seismic data.	seismic refraction methods • Refraction seismic data processing • Interpretation and modeling of seismic refraction • Geological interpretation of refraction seismic data "Main literature - chapter 11 Practicum Module-04 "				Able to make a refractive seismic survey design, Able to do refraction seismic data processing Able to interpret refraction seismic data and make subsurface modeling based on refraction seismic data	
8	Mid Semester Evaluation						40%
9	**[C3, P3,A3]** Understanding the basic concepts of the seismic reflection method. Being able to make a reflection seismic survey design,	" The basic concept of the seismic method of reflection; Survey design and measurement of seismic reflection methods; "Main literature - chapters 8 & 9 Supporting literature 1 - chapter 7 Practicum Module-05 "	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Understanding the basic concepts of the seismic reflection method.	"5% Task"

10	**[C3, P3,A3]** Being able to reflection seismic data processing.	Processing reflection seismic data; Interpretation and modeling of seismic reflection "Main literature - chapters 8 & 9 Supporting literature 1 - chapter 7 Practicum Module-05 "	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to make reflection seismic survey design, Able to do reflection seismic data processing	"5% Task"
11	[C3, P3,A3] Being able to interpret seismic reflection data	"Geological interpretation of reflection seismic data; Basic geological concepts; Interpretation Procedure Geological features of seismic data "Main literature - chapter 10 Practicum Module-06 "	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to interpret reflection seismic data and make subsurface modeling based on reflection seismic data	"5% Task"

12	[C3, P3,A3] Being able to make subsurface modeling based on seismic reflection data.	Subsurface modeling based on seismic reflection data "Main literature - chapter 10 Practicum Module-06 "	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary **Quiz-02**	Being able to make subsurface modeling based on seismic reflection data	"5% Task"
13	[C3, P3,A3] Knowing the latest developments in seismic exploration methods	"3D seismik refleksi Main literature - chapters 12, 13, 14	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Knowing the development of the latest exploration seismic methods with special techniques	"5% Task"
14	[C3, P3,A3] Knowing the special techniques used in exploration activities using seismic methods	VSP survey Borehole seismik survey" Main literature - chapters 12, 13, 14	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Knowing the development of the latest exploration seismic methods with special techniques	"5% Task"
15	[C3, P3,A3] Students are able understand and able to explain the basic concepts of the seismic exploration	Case study "Utilization Seismic exploration methods " Study of literature from various sources	Group paper presentations, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Being able to make a brief paper about the use of seismic methods Being able to present papers on	"5% Task"

	method and explain how to use the seismic method, both the refraction method and the reflection method in geophysical exploration activities					the results of literature studies made Able to conduct scientific discussions with a question and answer mechanism	
16	End Semester Evaluation						40%

REFERENCES :

1. Shearer, P. M., 2009, Introduction to Seismology, Cambridge University Press, Cambridge, UK.
2. Zobin, V. M., 2012, Introduction to Volcanic Seismology, Elsevier, London, UK.
3. Jens Havskov, Gerardo Alguacil (auth.)-Instrumentation in Earthquake Seismology-Springer International Publishing (2016)
4. Barbara Romanowicz, Adam Dziewonski-Seismology and Structure of the Earth_ Treatise on Geophysics-Elsevier (2009)
5. Agustin Udías-Principles of Seismology-Cambridge University Press (2000).
6. Thorne Lay, Terry C. Wallace-Modern Global Seismology, Vol. 58-Academic Press (1995
7. V. I. Keilis-Borok (auth.), V. I. Keilis-Borok, Edward A. Flinn (eds.)-Computational Seismology-Springer US (1995)

Program Study	Geophysical Engineering Department
Course	Inversion Method
Course Code	RF184518
Semester	V (Five)
Credit	3 (Three) SKS
Lecturer	Juan Pandu Gya Nur Rochman, S.Si., M.T.

Study materials	Mathematics, Programming		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;

		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.4	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
		3.5	understanding the concepts, principles and techniques of system design, process or application component of geophysical engineering in procedurally starting from data retrieval, processing, interpretation and modeling to solve the problems of geophysics engineering in deep;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
		4.12	being able to criticize the complete operational procedures in solving the problems of geophysical engineering technology that has been and / or is being implemented and poured in the form of scientific papers.
LO - Course	[C3,P3,A3] Students can apply the basic concept of inversion (inverse theorem) and inversion parameters of measured data to solve inversion problems in geophysics both linear and non-linear.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	2	3	4	5	6	7	8
1	[C4, P3,A3] [Conceptual , knowledge, analyze]: Students can understand the basic concepts of inversion, data, error, probability and distribution methods	Introduction, Data, errors, probability and distribution concepts	Direct Lecture 120 minute Discussion 30 minute	150 minute	Make a summary	Able to analyze data quality and error also distribution of data. Understand the concept of inversion method	5% Task
2	[C4, P3,A3] [Conceptual , knowledge, Analyze]: Students can understand the basic concepts of linear systems in inversion methods	Linear systems	Direct Lecture 120 minute Discussion 30 minute	150 minute	Make a summary	Able to understand the basic concepts of Linear Systems	5% Task
3	[C4, P3,A3] [Conceptual , knowledge, Analyze]: Mahasiswa memahami konsep dasar Vector norms dan mampu menyelesaikan kasus	Vector norms, overdetermined problem	Direct Lecture 120 minute Discussion 30 minute	150 minute	Make a summary	Able to understand the basic concepts of Vector norms and be able to solve cases of overdetermined problems	5% Task

	overdetermined problem						
4	[C4, P3,A3] [Conceptual , knowledge, Analyze]: Students can understand the basic concepts of Simple Least Square and are able to solve Simple Least Square cases	Simple least squares solution	Direct Lecture 120 minute Discussion 30 minute	150 minute	Make a summary Quiz-01	Able to understand the basic concepts of Simple Least Square and be able to solve Simple Least Square cases	5% Task 20% Quiz
5	[C4, P3,A3] [Conceptual , knowledge, Analyze]: Students understand the basic concepts of Mixed problems, damped least squares and are able to solve cases of underdetermined problems	Mixed problems, damped least squares dan underdetermined problems	Direct Lecture 120 minute Discussion 30 minute	150 minute	Make a summary	Able to understand the basic concepts of Mixed problems, damped least squares and able to solve cases of underdetermined problems	5% Task
6	[C4, P3,A3] [Conceptual , knowledge, Analyze]: Students can understand the basic concepts of the	Weighted least squares	Direct Lecture 120 minute Discussion 30 minute	150 minute	Make a summary	Able to understand the basic concepts of Weighted least squares	5% Task

	Weighted least square method						
7	[C4, P3,A3] [Conceptual , knowledge, Analyze]: Students can understand the basic concepts of Resolution	Resolution: data and model	Direct Lecture 120 minute Discussion 30 minute	150 minute	Make a summary	Able to understand the basic concepts of Resolution	5% Task
8	Mid Semester Evaluation						40%
9	[C4, P3,A3] [Conceptual , knowledge, Analyze]: Students can understand the basic concepts of covariance	Covariance: data and model	Direct Lecture 120 minute Discussion 30 minute	150 minute	Make a summary	Able to understand the basic concepts of covariance	5% Task
10	[C4, P3,A3] [Conceptual , knowledge, Analyze]: Students can understand the basic concepts of non-linear inversion methods using Newton's approach and Gradient methods	Nonlinear problems: Newton and Gradient methods	Direct Lecture 120 minute Discussion 30 minute	150 minute	Make a summary	Able to solve non-linear problem using Newton and Gradient methods	5% Task

11	[C4, P3,A3] [Conceptual , knowledge, Analyze]: Students can understand the basic concept of non-linear inversion method using Grid and Monte Carlo searches approach	Nonlinear problems: Grid and Monte Carlo searches	Direct Lecture 120 minute Discussion 30 minute	150 minute	Make a summary	Able to solve non-linear problems using Grid and Monte Carlo searches	5% Task
12	[C4, P3,A3] [Conceptual , knowledge, Analyze]: Students can understand the basic concepts of non-linear inversion method using simulated anealing approach	Nonlinear problems: Simulated Annealing	Direct Lecture 120 minute Discussion 30 minute	150 minute	Make a summary Quiz-02	Able to solve non-linear problem using Simulated annealing method	5% Task 20% Quiz-02
13	[C4, P3,A3] [Conceptual , knowledge, Analyze]: Students can understand the basic concepts of model based seismic data inversion methods	Seismic inversions: Recursive (Bandlimited) and Model Based (Blocky)	Direct Lecture 120 minute Discussion 30 minute	150 minute	Make a summary	Able to seismic data inversion using model based methods	5% Task

14	[C4, P3,A3] [Conceptual , knowledge, Analyze]: Students can understand the basic concept of the Sparse Spike seismic data inversion method	Seismic inversion: Sparse Spike	Direct Lecture 120 minute Discussion 30 minute	150 minute	Make a summary	Able to seismic data inversion using the Sparse Spike method	5% Task
15	[C4, P3,A3] [Conceptual , knowledge, Analyze]: Students can analyze the application of inversion methods in geophysics.	Case Study Reference Paper	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation & Review Paper	Able to review paper	5% Task
16	End Semester Evaluation						

REFERENCES :

1. Menke, W., Geophysical Data Analysis: Discrete Inverse Theory, Academic Press, 1989.
2. Tarantola, A., Inverse Problem Theory: Methods for Data Fitting and Model Parameter Estimation, Elsevier, 1987.
3. Sen, M.K., Stoffa, P.L., Global Optimization Methods in Geophysical Inversion, Elsevier, 1995
4. Grandis, H., Pengantar Inversi Geofisika, HAGI, 2009.

Program Study	Geophysical Engineering Department
Course	Geological Disaster Mitigation
Course Code	RF184519
Semester	V (Five)
Credit	3 (Three) SKS
Lecturer	Dr. Ir. Amien Widodo, M.S.

Study Materials	Geology, natural disaster

Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.8	understanding the principle and methods of mapping application that required in general geophysical engineering work;
		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
	Specific Skills	4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;

		4.11	capable of reading maps and satellite imagery, determining map orientation in the field using GPS, compass and satellite data; and
		4.12	being able to criticize the complete operational procedures in solving the problems of geophysical engineering technology that has been and / or is being implemented and poured in the form of scientific papers.
LO - Course	[C4,P3,A3] Students are able to apply geophysics exploration methods, combine geophysical and geological data to produce accurate interpretations, also competent in geological and geophysical field survey.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	2	3	4	5	6	7	8

1	Students are able to understand the purpose of the course, lecture rules, teaching scope, definition of vulnerability, hazard and risk	Course purpose, class rules, teaching scope, definition of vulnerability, hazard and risk	Brainstorming (20 minutes), Introductory lecture (100 minutes), Discussion (30 minutes)	Brainstorming (20 minutes), Introductory lecture (100 minutes), Discussion (30 minutes)	Discussion	Learning process agreement, Definition of vulnerability, hazard and risk	
2	Students are able to understand the purpose of the course, lecture rules, teaching scope, definition of vulnerability, hazard and risk	Course purpose, class rules, teaching scope, definition of vulnerability, hazard and risk	Brainstorming (20 minutes), Introductory lecture (100 minutes), Discussion (30 minutes)	. Brainstorming (20 minutes), Introductory lecture (100 minutes), Discussion (30 minutes)	Discussion	Learning process agreement, Definition of vulnerability, hazard and risk	
3	Students are able to understand the meaning of landslide disaster, landslide occurrence controller factors, landslide occurrence trigger factors, landslide mechanism, landslide management methods, study case of landslide in Indonesia.	the meaning of landslide disaster, landslide occurrence controller factors, landslide occurrence trigger factors, landslide mechanism. Lee,E.M and Jones, D. K. C,2004, landslide risk assessment, Thomas Telford	self-learning and simple paper making and group presentation about land movement disaster.	Direct Lecture(30 minutes), group presentation(40 minutes) Group discussion(30 minutes), (Assignment-2: Problem & Solving),	Discussion	The accuracy of understanding the meaning of landslide disaster, landslide occurrence controller factors, landslide occurrence trigger factors, landslide mechanism, landslide	

						management methods	
4	Students are able to understand the meaning of landslide disaster, landslide occurrence controller factors, landslide occurrence trigger factors, landslide mechanism, landslide management methods, study case of landslide in Indonesia.	Landslide management meethods. Lee,E.M and Jones, D. K. C,2004, landslide risk assessment, Thomas Telford	self-learning and simple paper making and group presentation about land movement disaster.	Direct Lecture(30 minutes), group presentation(40 minutes) Group discussion(30 minutes), (Assignment-2: Problem & Solving),	Presentation	The accuracy of understanding the meaning of landslide disaster, landslide occurrence controller factors, landslide occurrence trigger factors, landslide mechanism, landslide management methods	10%

5	Students are able to understand the meaning of earthquake, types of earthquake wave, earthquake occurrence mechanism, earthquake management methods, study case of earthquake in Indonesia.	the meaning of earthquake, types of earthquake wave, earthquake occurrence mechanism, David, D.,2003,Earth quake risk reduction, John Wiley and Son	self-learning and simple paper making and group presentation about land movement disaster.	Direct lecutre (60 minutes), rock observation in megascopic(30 minutes), group discussion(50 minutes), quiz(10 minutes)	Discussion	the accuracy of understanding the meaning of earthquake, types of earthquake wave, earthquake occurrence mechanism, earthquake management methods, study case of earthquake in Indonesia.	
6	Students are able to understand the meaning of earthquake, types of earthquake wave, earthquake occurrence mechanism, earthquake management methods, study case of earthquake in Indonesia.	earthquake management methods, study case of earthquake in Indonesia. David, D.,2003,Earth quake risk reduction, John Wiley and Son	self-learning and simple paper making and group presentation about land movement disaster.	Direct lecutre (60 minutes), rock observation in megascopic(30 minutes), group discussion(50 minutes), quiz(10 minutes)	Presentation	the accuracy of understanding the meaning of earthquake, types of earthquake wave, earthquake occurrence mechanism, earthquake management methods, study case of earthquake in Indonesia.	10%

7	Students are able to understand the meaning of flood, flood occurrence mechanism, flood management methods, study case of flood in Indonesia.	the meaning of flood, flood occurrence mechanism	self-learning and simple paper making and group presentation about flood disaster.	Direct lecutre (60 minutes), rock observation in megascopic(30 minutes), group discussion(50 minutes), quiz(10 minutes)	Presentation	the accuracy of understanding the meaning of flood, flood occurrence mechanism, flood management methods, study case of flood in Indonesia.	
8	Mid Semester Evalution						20%
9	Students are able to understand the meaning of flood, flood occurrence mechanism, flood management methods, study case of flood in Indonesia.	flood management methods, study case of flood in Indonesia.	self-learning and simple paper making and group presentation about flood disaster.	Direct lecutre (60 minutes), rock observation in megascopic(30 minutes), group discussion(50 minutes), quiz(10 minutes)	Presentation	the accuracy of understanding the meaning of flood, flood occurrence mechanism, flood management methods, study case of flood in Indonesia.	10%
10	Students are able to understand the meaning of tsunami disaster.	the meaning of tsunami disaster, types of earthquake wave, earthquake occurrence mechanism,	self-learning and simple paper making and group presentation about tsunami disaster.	Direct lecutre (60 minutes), rock observation in megascopic(30 minutes), group discussion(50 minutes), quiz(10 minutes)	Presentation	the meaning of tsunami disaster	

11	Students are able to understand the meaning of tsunami disaster.	tsunami management methods, study case of tsunami in Indonesia.	self-learning and simple paper making and group presentation about tsunami disaster.	Direct lecutre (60 minutes), rock observation in megascopic(30 minutes), group discussion(50 minutes), quiz(10 minutes)	Presentation	tsunami management methods	10%
12	Students are able to understand the meaning of volcanic eruption disaster.	the meaning of volcanic eruption disaster.	self-learning and simple paper making and group presentation about volcanic eruption disaster.	Direct lecutre (60 minutes), rock observation in megascopic(30 minutes), group discussion(50 minutes), quiz(10 minutes)	Discussion	the meaning of volcanic eruption disaster	
13	Students are able to understand the meaning of volcanic eruption disaster.	volcanic eruption management methods, study case of volcanic eruption in Indonesia.	self-learning and simple paper making and group presentation about volcanic eruption disaster.	Direct lecutre (60 minutes), rock observation in megascopic(30 minutes), group discussion(50 minutes), quiz(10 minutes)	Presentation	the meaning of volcanic eruption disaster	10%

14	Government Policies	Policies on Disaster mitigation unit, Government policies on disaster mitigation and anticipation.	Self-learning	Direct Lecture (60 minutes) Discussion (60 minutes)	Discussion	understand the government policies on disaster mitigation	
15	Hazard estimation level using geographic information system	hazard mapping on study case disaster in Indonesia	Self-learning	Direct Lecture (60 minutes) Discussion (60 minutes)	Presentation and discussion	understand the disaster hazard mapping	10%
16	End Semester Evaluation						20%

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1. Hamblin, W.K., 1982; The Earth's Dynamic Systems; 3rd Edition. Minesotta.
2. http://www.tulane.edu/~sanelson/Natural_Disasters/oinformatic for Disasters ://nidm.gov.in/PDF/modules/geo.pdf
3. ftp://ftp.itc.nl/pub/westen/Multi_hazard_risk_course/Powerpoints/Background%20paper%20Spatial%20data%20for%20hazard%20and%20risk%20assessment.pdf
4. https://www.bnpb.go.id/home/get_publikasi/12/buku
5. https://www.bnpb.go.id/home/get_publikasi/13/jurnal
6. https://www.marshall.edu/cegas/geohazards/2015pdf/Session1/03_GeobruggCanopyPP.pdf
7. https://www.bnpb.go.id/home/aplikasi

Program Study	Geophysical Engineering Department
Course	Thermodynamics
Course Code	RF184520
Semester	V (Five)
Credit	3 (Three) SKS
Lecturer	Juan Pandu Gya Nur Rochman, S.Si., M.T.

Study Materials	Temperature, Dynamics		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.1	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
	Specific Skills	4.12	being able to criticise the complete operational procedure in solving geophysical engineering technology problems which has been and / or is being implemented, and set forth in the form of scientific work papers.

LO - Course	[C4,P3,A3] Students are able to analyse thermodynamics system, thermodynamics law, empirical relation of thermodynamic variables, imaging technique of thermodynamics variable components, and geoscience interpretation, also the application of thermodynamics in geoscience.

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Assessment		
					Student's Learning Experience	Criteria and Indicators	Weight (%)
KONSEP TERMODINAMIKA, SISTEM,SUHU,PANAS,ENERGI, DAN KERJA, HK 1&2 TERMODINAMIK							
(1,2)	[C3,P3,A2][Conceptual knowledge, Application] : Students are able to explain the basic concept of Thermodynamics	The concept of Thermodynamics [1]:K1_Introduction K2_Study Case/Application	Introductory Lecture, lecture contract and brainstorming (Assignment-1: Review on Thermodynamics and its applications 4x50")	[TM: 2x(4x50")]	Oral Quiz	The accuracy of explaining the basic concept of thermodynamics, and its scope	10%
3	[C3,P3,A2][Conceptual knowledge, Application] : Students are able to explain the thermodynamics system, temperature, and energy	Thermodynamics system Temperature, Energy, and Works	Direct Lecture, Group Discussion; (Assignment-2: Problem & Solving) [BT+BM:2x(4x50")]	[TM: 1x(4x50")]	Oral Quiz	The accuracy of explaining thermodynamics system The accuracy of explaining	10%

						temperature, energy, and works	
(4,5)	[C3,P3,A2][Conceptual knowledge, Application] : Students are able to explain first thermodynamics law and its application, heat, and enthalpy	First thermodynamics law	Direct Lecture, Group Discussion;	[TM: 1x(4x50")]	Written Quiz-1	The accuracy of explaining First thermodynamics law	10%
		Heat and Enthalpy	(Assignment-3: First thermodynamics law exercises [BT+BM:2x(4x60")]			The accuracy of applying First thermodynamics law	
						Solving Thermodynamics Law 1 Problems	
6	[C3,P3,A2][Conceptual knowledge, Application] : Students are able to explain second thermodynamics law and its application	Second thermodynamics law	Direct Lecture, Group Discussion;	[TM: 2x(4x50")]	Written Quiz-1	The accuracy of explaining First thermodynamics law	10%
		The concept of Entropy			Group Presentation	The accuracy of solving problems	
		Reversible - Irreversible	(Assignment -4: Exercises (BT+BM:2x(4x60")]			The accuracy of explaining the concept of reversible and irreversible	

7	[C3,P3,A2][Conceptual knowledge, Application] : Students are able to explain and solve the Gibbs-Helmholtz equation and Maxwell equation in thermodynamics	Gibbs-Helmholtz equation	Direct Lecture, Group Discussion;	[TM: 2x(4x50")]	Written Quiz-1	The accuracy of explaining and solving Gibbs-Helmholtz equation	10%
		Maxwell equation	Assignment: Exercises			The accuracy of explaining and solving Maxwell equation	
8	Mid Test Evaluation						
PHASE DIAGRAM, THERMODYNAMICS APPLICATION ON GEOLOGY< GEOTHERMAL, FLUID FLOW							
(9, 10)	[C3,P3,A2][Conceptual knowledge, Application] : Students are able to explain clapericon and phase diagram	Phase Diagram	Direct Lecture, Group Discussion;	[TM: 2x(4x50")]	Written Quiz-1	The accuracy of explaining phase diagram, and solving problems	10%
		Clapericon relations				The accuracy of explaining Clapericon relations and solving problems	
(11, 12)		Thermodynamics on minerals	Group Discussion;	[TM: 2x(4x50")]		The accuracy of explaining the application of	10%

	[C3,P3,A2][Conceptual knowledge, Application] : Students are able to explain the application of thermodynamics in geology and geothermal				Group Assignment: Study Case	thermodynamics in Geology	
		Thermodynamics on Geothermals [2] : 145-197	Assignment: Review on Application in Geothermal and Geology			The accuracy of explaining the application of thermodynamics in Geothermals	
(13, 14)	[C3,P3,A2][Conceptual knowledge, Application] : Students are able to explain fluids and fluid dynamics	Fluids	Direct Lecture and brainstorming, Group Discussion;	[TM: 2x(4x50")]	Group Assignment: Study Case	The accuracy of explaining fluids and solving problems	15%
		Fluid dynamics: Newtonian, non-newtonian, Bernoulli, and Viscosity [2] : 145-197				The accuracy of explaining fluid dynamics and solving problems	
15	[C3,P3,A2][Conceptual knowledge, Application] : Students are able to explain the empirical fluids	viscous flow : Empirical Parameter : Reynold, Releigh, Prandtl, Peclet	Study Case & Group Discussion	[TM: 1x(4x50")]	Written Quiz-1	The accuracy of explaining empirical fluids and problems example	15%
			(Assignment -5 : Exercises [BT+BM:2x(4x60")]		Group Assignment : study case		

16	End Semester Evaluation	

REFERENCES :

1. Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, Margaret B. Bailey, Fundamentals Of Engineering Thermodynamics, John Wiley & Sons, 2014
2. Anderson, G.M.,Thermodynamics of Natural Systems (2nd edition),Cambridge University Press, 2009

Program Study	Geophysical Engineering Department
Course	Capita Selecta
Course Code	RF184521
Semester	V (Five)
Credit	2 (T:2) SKS
Lecturer	1. Dr. Ayi Syaeful Bahri, S.Si., M.T. 2. Dr. Ir. Amien Widodo, M.S.

Study Materials	Topics adapted to the latest developments or / and at the request of the Stakeholder		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.5	understanding the concepts, principles and techniques of system design, process or application component of geophysical engineering in procedurally starting from data retrieval, processing, interpretation and modeling to solve the problems of geophysical engineering in depth;

		3.6	understanding the complete operational knowledge related to the field of geophysical engineering technology;
		3.7	understanding the factual insights and technology application methods; codes and national/international standards as well as the regulations in force in his/her work area to carry out geophysical engineering technology work in depth;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
LO - Course	[C2,P2,A2] Students are able to understand the development in exploration technology in the context of utilization of natural resources, environment and energy as well as specific topics relevant to the latest developments.		

Week	The Expected of Sub LO-Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience*	Criteria and Indicators	Weight (%)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	[C4,P4,A4] [Conceptual knowledge, Analyze] Students are able to understand and master the current conditions of a given topic	Introduction to current developments of a given topic	Introductory Lecture, Brainstorming; **(Assignment : Write a Resume on current developments**	TM: (2x50")	Discussion (application and development of a given topic); **Assignment : Fundamentals of a given topic's concept**	Get to know the basic theoretical concept of current developments of a given topic in general	

			of a given topic)				
2	[C4,P4,A4] [Conceptual knowledge, Analyze] Students are able to understand the basic concept of a given topic	The concept and basic principle of a given topic (subject - 1)	Direct Lecture, Discussion ;	TM: (2x50")	Discussion (The concept and basic principle of a given topic); **Assignment : Study Case of a given topic's problem analysis**	The accuracy of explaining	
3	[C4,P4,A4] [Conceptual knowledge, Analyze] Students are able to understand the basic concept of a given topic	The concept and basic principle of a given topic (subject - 2)	Direct Lecture, Discussion ;	TM: (2x50")	Discussion (The concept and basic principle of a given topic);	The accuracy of explaining	
4	[C4,P4,A4] [Conceptual knowledge, Analyze] Students are able to understand the basic concept of a given topic	The concept and basic principle of a given topic (subject - 3)	Direct Lecture, Discussion ;	TM: (2x50")	Discussion (The concept and basic principle of a given topic);	The accuracy of explaining	

5	[C4,P4,A4] [Conceptual knowledge, Analyze] Students are able to understand and analyse the basic concept of a given topic	The concept and basic principle of a given topic (subject - 4)	Direct Lecture, Discussion ;	TM: (2x50")	Discussion (The concept and basic principle of a given topic);	The accuracy of explaining	
6	[C4,P4,A4] [Conceptual knowledge, Analyze] Students are able to understand and analyse the basic concept of a given topic	The concept and basic principle of a given topic (subject - 5)	Direct Lecture, Discussion ;	TM: (2x50")	Discussion (The concept and basic principle of a given topic);	The accuracy of explaining	
7	[C4,P4,A4] [Conceptual knowledge, Analyze] Students are able to understand and analyse the basic concept of a given topic	The concept and basic principle of a given topic (subject - 6)	Direct Lecture, Discussion ;	TM: (2x50")	Discussion (The concept and basic principle of a given topic);	The accuracy of explaining	
8	Mid Semester Evaluation						20%
9	[C4,P4,A4] [Conceptual knowledge, Analyze] Students are able to understand, analyse, and apply the basic concept of a given topic	The concept and basic principle and applications of a given topic subject - 7 (Study case 1)	Direct Lecture, Discussion ;	TM: (2x50")	Discussion (The concept and basic principle of a given topic); **Assignment : Analysing and Applying in study case, presented per small group (2-3 ppl)**	The accuracy of explaining	

10	[C4,P4,A4] [Conceptual knowledge, Analyze] Students are able to understand, analyse, and apply the basic concept of a given topic	The concept and basic principle and applications of a given topic subject - 8 (Study case 1)	Direct Lecture, Discussion ;	TM: (2x50")	Discussion (The concept and basic principle of a given topic); **Assignment : Analysing and Applying in study case, presented per small group (2-3 ppl)**	The accuracy of explaining	
11	[C4,P4,A4] [Conceptual knowledge, Analyze] Students are able to understand, analyse, and apply the basic concept of a given topic	The concept and basic principle and applications of a given topic subject - 9 (Study case 1)	Direct Lecture, Discussion ;	TM: (2x50")	Discussion (The concept and basic principle of a given topic); **Assignment : Analysing and Applying in study case, presented per small group (2-3 ppl)**	The accuracy of explaining	
12	[C4,P4,A4] [Conceptual knowledge, Analyze] Students are able to understand, analyse, and apply the basic concept of a given topic	The concept and basic principle and applications of a given topic subject - 10 (Study case 1)	Direct Lecture, Discussion ;	TM: (2x50")	Discussion (The concept and basic principle of a given topic); **Assignment : Analysing and Applying in study case, presented per small group (2-3 ppl)**	The accuracy of explaining	20%

13	[C4,P4,A4] [Conceptual knowledge, Analyze] Students are able to understand, analyse, and apply the basic concept of a given topic in a project/ a research	The concept and basic principle and applications of a given topic in self-project subject - 11 (Study case 1)	Direct Lecture, Discussion ;	TM: (2x50")	Discussion (The concept and basic principle of a given topic); **Assignment : Analysing and Applying in study case, in self-project, presented per small group (2-3 ppl)**	The accuracy of explaining	
14	[C4,P4,A4] [Conceptual knowledge, Analyze] Students are able to understand, analyse, and apply the basic concept of a given topic in a project/ a research	The concept and basic principle and applications of a given topic in self-project subject - 12 (Study case 1)	Direct Lecture, Discussion ;	TM: (2x50")	Discussion (The concept and basic principle of a given topic); **Assignment : Analysing and Applying in study case, in self-project, presented per small group (2-3 ppl)**	The accuracy of explaining	
15	[C4,P4,A4] [Conceptual knowledge, Analyze] Students are able to understand, analyse, and apply the basic concept of a given topic in a project/ a research	The concept and basic principle and applications of a given topic in self-project subject - 12 (Study case 1)	Direct Lecture, Discussion ;	TM: (2x50")	Discussion (The concept and basic principle of a given topic); **Assignment : Analysing and Applying in study case, in self-project, presented per person (Tugas Besar)**	The accuracy of explaining	20%
16	End Semester Evaluation						20%

REFERENCES :

1. Telford, WM; Geldart, L.P; Sheriff, RE, 1998, Applied Geophysics, Cambridge Univ Press, Cambridge.
2. Geophysics Journal and Near-Surface Geophysics Journal
3. Geothermal Journal
4. SPE Journal

Program Study	Geophysical Engineering Department
Course	Data Analysis Well Log
Cource Code	RF184622
Semester	VI (Six)
Credit	4 SKS (T:3, P:1)
Lecturer	Firman Syaifuddin, S.Si., M.T.

Study materials	Seismic, Logging		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;

	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.1	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
		3.2	understanding geological knowledge that required to understand the geological process of a natural phenomenon by its characteristics;
		3.3	understanding the theoretical concept of statistics to define the process complexity of a natural phenomenon;
		3.5	understanding the concepts, principles and techniques of system design, process or application component of geophysical engineering in procedurally starting from data retrieval, processing, interpretation and modeling to solve the problems of geophysics engineering in deep;
		3.6	understanding the complete operational knowledge related to the field of geophysical engineering technology;
		3.8	understanding the principle and methods of mapping application that required in general geophysical engineering work;
		3.9	mastering the principles of quality assurance in general in geophysics engineering work;

		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
		3.11	mastering factual knowledge of current principles and issues in economic, socio-cultural and ecological issues in general that have an influence on the field of geophysics engineering;
		3.14	mastering general concepts, principles, and techniques of effective communication orally and in writing for specific purposes in general; and
		3.15	mastering factual knowledge about the development of cutting-edge technology and advanced materials in the field of geophysical engineering in deep
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.3	being able to conduct research that includes identification, formulation, and analysis of geophysical engineering problems;
		4.4	being able to formulate alternative solutions to solve complex geophysical engineering problems by considering economic, health, public safety, cultural, social and environmental factors;

		4.5	being able to design systems, processes, and components with an analytical approach and consider technical standards, aspects of performance, reliability, ease of application, sustainability and pay attention to economic, health and public safety, cultural, social and environmental factors;
		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.9	being able to recognize the difference of land and sea exploration field characteristics that can be affected into the quality of measurement data;
LO – Course	[C3,P3,A3] Students can understand the basic concepts of formation evaluation, wellbore environment, working principles and measurement of well logging, understanding theories about well log including interpreting well log data, being able to apply the concept of well log for evaluation of formation.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	2	3	4	5	6	7	8

1	[C3, P3,A3] Students can understand what will be learned in this lecture, understanding the fundamentals of rock physics parameters	1. Introduction to Lecture: • Semester Learning Plans • College Contracts • Scoring system 2. Review of rock physics courses (physical parameters of rocks)	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50")	Discussion; Make a summary	Understanding what will be learned in this lecture Understanding the basic parameters of rock physics	"5% Task"
2	[C3, P3,A3] Students can understand the terms in well log, understanding well log data types, understanding terms in the borehole environment, knowing well log data collection tools, know how to collect well log data	• Terminology in well log • Well log data types • Borehole enviroment • Well log measurement equipment • Acquisition of well log data Main Book 1 chapter-01	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Being able to explain the terms used in well log Understanding the types of well log data types Understanding the terms in borehole environment Knowing well log data equipment, know how to collect well log data	"5% Task"

3	[C3, P3,A3] Students can understand the basic equations, rock types, physical properties of rocks in analyzing well log data	The basic equation in analyzing well log data Rock and fluid properties • Rock classification • Porosity • Saturation • Permeability • Capillary pressure • Fluid property • Salinity • Temperature formation Main Book 2 chapter-01	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Understanding the basic equations used in well logging data analysis Being able to explain the types of rock types based on physical properties Understanding rock types, physical properties in well log data	"5% Task"
4	[C3, P3,A3] Knowing the characteristic of the potential self-log data, gamma ray and resistivity, Understanding the information contained in each well logging data	• Log self-potential • Log Gamma ray • Log Resistivitas Main Book 2 chapter -02,03 & 05	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary **Quiz-01**	Knowing the characteristic of the potential self-log data, gamma ray and resistivity Understanding the information in each well logging data	"5% Task" **15% Quiz**
5	[C3, P3,A3]	"• Log densitas • Log sonic	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion;	Knowing the characteristic of	"5% Task"

	Knowing the characteristic of the density, sonic, neutron and porosity log data, Understanding the information in each well logging data	• Log neutron • Log Porositas " Main Book 2 chapter -04			Make a summary	density, sonic, neutron and porosity log data Understanding the information in each well log data	
6	[C3, P3,A3] Knowing the characteristic of the data log Magnetic resonance imaging (NMR) and Borehole imaging, Understanding the information in each data well log	"• Log Magnetic resonance imaging (NMR) • Borehole imaging " Main Book 2 chapter -06 & 09	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Knowing the characteristic of the magnetic resonance imaging (NMR) and Borehole imaging log data Understanding the information in each well log data	"5% Task"
7	[C3, P3,A3] Knowing how to evaluate data quality, understanding how to define reservoir layers, understanding how to calculate reservoir parameters	"Quicklook Log Interpretation • Evaluation of the quality of well log data • Identify reservoir layers • Identification of types and limits of fluid contact	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Being able to evaluate the quality of well log data Being able to determine the reservoir layer	"5% Task"

		• Calculation of porosity • Calculation of hydrocarbon saturation • Calculation of permeability " Main Book 1 chapter-02				Being able to calculate reservoir parameters	
8	Mid Semester Evaluation						40%
9	[C3, P3,A3] Understanding how to interpret well log data by utilizing all available information, determine effective reservoir parameters	"Full Interpretation • Defining net sand • Calculation of effective porosity • Archie saturation calculation • Calculation of effective permeability " Main Book 1 chapter-03	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Understanding how to interpret well log data by utilizing all available information Being able to determine effective reservoir parameters	"5% Task"
10	[C3, P3,A3] Understanding some advanced interpretation	"Advanced Log Interpretation Techniques • Shaly sand analysis	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Knowing the advanced interpretation techniques of well log data	"5% Task"

	techniques for well log data	• Carbonates • Multi mineral analysis • Thin bed analysis • Borehole correction " Main Book 1 chapter -05				Being able to interpret well log data	
11	[C3, P3,A3] Knowing how to integrate well log data with seismic data, understanding the concept of mechanical rock	"Integration with Seismic • Synthetic Seismograms • Fluid Replacement Modeling • Acoustic/Elastic Impedance Modeling Rock Mechanics " Main Book 1 chapter -06 & 07	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to integrate seismic data and well log data Knowing the concept of mechanical rock	"5% Task"
12	[C3, P3,A3] Knowing the economic terms from the results of	"Value of Information • Capital expenses • Operating expenses	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to explain economic terms from the results of well log data interpretation	"5% Task"

	interpretation of well log data	• Net present value Equitydetermination s • Gross bulk volume • Net pore volume • Hydrocarbon pore volume • Barrels of oil equivalent • Reserves. " Main Book1 chapter -08 & 09			Quiz-02	"able to do calculations • Gross bulk volume • Net pore volume • Hydrocarbon pore volume • Barrels of oil equivalent • Reserves. "	
13	[C3, P3,A3] Knowing the basics of geological concepts in integrating the results of well log data interpretation, Knowing the terms reservoir engineering	"Production Geology Issues • Understanding Geological Maps • Basic Geological Concepts Reservoir Engineering Issues • Behavior of Gases • Behavior of Oil/Wet Gas Reservoirs • Material Balance • Darcy's Law • Well Testing "	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Knowing the basics of geological concepts used in integrating the results of well logging data interpretation Able to explain the terms reservoir engineering	"5% Task"

		Main Book1 chapter -10 & 11					
14	[C3, P3,A3] Knowing several terms in well drilling, understanding the physical properties of wellbore	"• Well Deviation • Surveying • Geosteering " Main Book1 chapter -13	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to explain several terms in well drilling Understanding the characteristic of the wellbore	"5% Task"
15	[C3, P3,A3] Being able to integrate well log data analysis	Case study	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to be integrated well log data analysis	"5% Task"
16	End Semester Evaluation						40%

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1. Darling, T., "Well Logging and Formation Evaluation", Elsevier Inc., 2005.Zobin, V. M., 2012, Introduction to Volcanic Seismology, Elsevier, London, UK.
2. Tiab, D. and Donaldson, E.C., "Petrophysics 2nd.", Elsevier, 2004.
3. Asquith, G. B. And Krygowski, D., "Basic Well Log Analysis, 2nd", American Association of Petroleoum Geologist, 2004.
4. Rider, M., "The Geological Interpretation of Well Logs, 2nd", Rider-French Consulting Ltd., 2002.
5. Asquith, G.B. And Gibson, C.R., "Basic Well Log Analysis for Geologist", American Association of Petroleoum Geologist, 1982.

Program Study	Geophysical Engineering
Course	Electromagnetic Exploration
Code	RF184623
Semester	VI (Six)
Credit	4 (T:2,P:2) SKS
Lecturer	Wien Lestari, S.T., M.T.

Study Materials	Waves, Mathematics, Geology		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skill	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.4	understanding the theoretical concepts of engineering science (engineering sciences), engineering principles and engineering design methods that required for the analysis and design of systems, processes, products or components in the field of deep geophysical engineering;
		3.5	understanding the concepts, principles and techniques of system design, process or application component of geophysical engineering in procedurally starting from

			data retrieval, processing, interpretation and modeling to solve the problems of geophysical engineering in depth;
		3.6	understanding the complete operational knowledge related to the field of geophysical engineering technology;
		3.10	understanding the concept and principle of environmental conservation in general from the activities of geophysical engineering;
		3.12	understanding the concept, principles, workshop procedures, studio and laboratory activities and implementation of safety, occupational health and environment (K3L) in general;
	Specific Skill	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.9	being able to recognize the difference of land and sea exploration field characteristics that can be affected into the quality of measurement data;

		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
		4.11	capable of reading maps and satellite imagery, determining map orientation in the field using GPS, compass and satellite data; and
		4.12	being able to criticize the complete operational procedures in solving the problems of geophysical engineering technology that has been and / or is being implemented, and poured in the form of scientific papers.
LO– Course	[C4,P4,A4] Students are able to hold the concepts, principles and techniques of system design, process or components of the Electromagnetic Method (GPR, VLF, and MT) application and carry them out procedurally starting from data collection, processing, analyzing the results of interpretation with subsurface geological conditions and modeling to complete deep surface geophysical engineering issues deeply in mine exploration, hydrogeology, geotechnical engineering and the environment as well as being responsible for the results of one's own work and groups through scientific reports and presentations.		

Week	The Expected of Sub LO-Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience*	Criteria and Indicators	Weight (%)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	[C4,P4,A4] Students are able to understand the electromagnetic method (EM) and its development	Introduction to the EM Method, the development of the EM method and general applications L1: introduction to EM methods and their development	Direct Lecture	DL: 2x(4x50")	Discussion	Get to know EM applications in general	

2	[C4,P4,A4] Students are able to explain the concept of EM methods	Basic principles EM methods, Maxwell's Equation L2: Electric Field Equation, Magnetic Field and Maxwell Equation	Direct Lecture	DL: 1x(4x50”);	Discussion	Accuracy explained	
3	[C4,P4,A4] Students are able to explain the concept of EM methods	L3 : Introduction to the magnetotelluric method, skin depth	Direct Lecture	DL: 1x(4x50”);	Discussion	Accuracy explained	
4	[C4,P4,A4] Students are able to explain the processing of the Magnetotelluric method	L4: Introduction to the data processing stages of the MT method	Direct Lecture	DL: 1x(4x50”);	Discussion	Accuracy explained	
5	[C4,P4,A4] Students are able to apply Magnetotelluric method processing	L5: Case study, data processing	Direct Lecture	DL: 1x(4x50”); [SL+Self-Learning:2x(4x60”)]	Practicum	The accuracy of applying a good filter to improve data quality	10%
6	[C4,P4,A4] Students are able to explain the concept of CSAMT-AMT and apply Magnetotelurik processing methods	L6: Case study, pengolahan data	Direct Lecture	DL: 1x(4x50”)	Discussion	Accuracy in explaining and comparing	10%

7	[C4,P4,A4] Students are able to explain the concept of CSAMT-AMT and apply Magnetotelurik processing methods	L7 : CSAMT and AMT data processing	Direct Lecture	DL: 1x(4x50”); [SL+Self-Learning:2x(4x60”)]	make resume paper with CSAMT and AMT-Practicum methods	The accuracy of applying a good filter to improve data quality	10%
8	Semester Middle Evaluation						30%
9	[C4,P4,A4] Students are able to explain the concept of Very Low Frequency	L9 : Introduction to the VLF method	Direct Lecture	DL: 1x(4x50”);	Discussion	Accuracy explained	
10	[C4,P4,A4] Students are able to explain the processing phase of Very Low Frequency	L10 : Introduction to the processing stages	Direct Lecture	DL: 1x(4x50”);	Discussion	Accuracy explained	
11	[C4,P4,A4] Students are able to explain the processing phase of Very Low Frequency	L11 : Introduction to the stages of modeling and development of the VLF method	Direct Lecture	DL: 1x(4x50”);	Discussion Resume	Accuracy explained	10%
12	[C4,P4,A4] Students are able to explain the concept of Ground Penetrating Radar	L12 : Introduction to the GPR method	Direct Lecture	DL: 1x(4x50”);	Discussion	Accuracy explained	
13	[C4,P4,A4]	L13 : Introduction to the processing stages	Direct Lecture	DL: 1x(4x50”);	Discussion Practicum	Accuracy explained	

	Students are able to explain the stages of GPR processing						
14	[C4,P4,A4] Students are able to apply the EM VLF and GPR methods	L14 : Introduction to the processing stages	Practicum	TM: 1x(4x50”); [BT+BM:2x(4x60”)]	Discussion Practicum	Accuracy explained	
15	[C4,P4,A4] Students are able to apply the EM VLF and GPR methods	L15 : Introduction to the processing stages	Practicum	TM: 1x(4x50”); [BT+BM:2x(4x60”)]	Discussion Practicum	Accuracy explained	
16	Semester Final Evaluation				Presentation Report		30%

REFERENCES :

1.Telford, W., Geldart, L.P., Sheriff, R. E. (1976). Applied Geophysics.Cambridge Univ Press, Cambridge.
2. Griffiths, D. J. (1999). Introduction to Electrodynamics, 3rd ed., Prentice Hall.
3. Zhdanov, M. S. (2009). Geophysical Electromagnetic Theory and Methods. Elsevier.
4. Simpson, F. and Bahr, K. (2005). Practical Magnetotelluric. Cambridge.
5. Jurnal Geofisika

Program Study	Geophysical Engineering Department
Course	Geotechnic
Cource Code	RF184624
Semester	VI (Six)
Credit	3 (T:3) SKS
Lecturer	Dr.Dwa Desa Warnana, S.Si., M.Si.

Study materials	Geology, Geophysics		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.4	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyze and design system, process, product, or component in geophysics engineering in deep;

		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
		3.12	understanding the concept, principle, workshop procedure, studio and laboratory activities, and Health and Safety Environment (HSE) in general;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.10	being able to recognize the difference of land and sea exploration field characteristics that can be affected into the quality of measurement data;
CP – Mata Kuliah	[C4,P4,A4] Students are able to master the concepts, principles and techniques of system design, process or component application of geophysical methods for environmental problems and carry them out procedurally starting from data collection, processing, analyzing the results of interpretation with subsurface geological conditions and modeling to solve physical environmental problems and mitigation deeply and responsibly towards the results of their own work and groups through scientific reports and presentations.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	[C4,P4,A4] Students are able to understand geotechnics concepts	Introduction	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50")	Discussion	the accuracy of explaining	5%
2	[C4,P4,A4] Students are able to understand the meaning and role of geophysics methods to solve engineering problems, for example the case of engineering geophysics applications; physical parameters and engineering	Geophysics methods to solve engineering problems, for example the case of engineering geophysics applications; physical parameters and engineering	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50") [BT+BM:2x(4x60")]	Discussion (plate dynamics in geophysics); **: Exercises**	the accuracy of explaining	10%
3	[C4,P4,A4] Students are able to understand the methodology, analysis and interpretation of technical geophysics;	Engineering geophysics methodology, analysis and interpretation;	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50") [BT+BM:2x(4x60")]	Discussion **Task-K10 : Exercises**	the accuracy of explaining	10%

4	[C4,P4,A4] Students are able to understand the methodology, analysis and interpretation of engineering geophysics;	Engineering geophysics methodology, analysis and interpretation;	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion **Task-K10 : Exercises**	the accuracy of explaining	10%
5	[C4,P4,A4] Students are able to understand the application of geophysics methods to technical geology problems	Application of geophysics methods to technical geology problems	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion **Task-K10 : Exercises**	the accuracy of explaining	10%
6	[C4,P4,A4] Students are able to understand the application of geophysics methods to technical geology problems	Application of geophysics methods to technical geology problems	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion **Task-K10 : Exercises**	the accuracy of explaining	10%
7	[C4,P4,A4] Case study	Case study	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion **Task-K10 : Exercises**	the accuracy of explaining	10%
8	Mid Semester Evaluation						30%
9	[C4,P4,A4] Students are able to apply geophysics methods to geotechnics problems	Geophysics methods for geotechnics problems	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50”)	Discussion (plate dynamics in geophysics);	Get to know the general formula of plate dynamics	

	(determination of geotechnics parameters from geophysics measurements)						
10	[C4,P4,A4] Students are able to apply geophysics methods to geotechnics problems (determination of geotechnics parameters from geophysics measurements)	Geophysics methods for geotechnics problems	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion (plate dynamics in geophysics); **Task-K10 : Exercises**	the accuracy of explaining	5%
11	[C4,P4,A4] Students are able to analyze geotechnical evaluations of soil conditions: soil corrosion,	geotechnical evaluation of soil conditions: soil corrosion,	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion	the accuracy of explaining and comparing	
12	[C4,P4,A4] Students are able to analyze geotechnical evaluations of soil conditions: soil corrosion,	geotechnical evaluation of soil conditions: soil corrosion,	Direct Lecture, Discussion;Video	TM: 1x(3x50”)	Discussion **Quiz-K12 :stress dan strain**	Ketepatan menjelaskan	5%
13	[C4,P4,A4] Students can understand the	Students are able to understand	Direct Lecture, Discussion;Video	TM: 1x(3x50”)	Discussion **Task-K13:**	the accuracy of explaining	10%

	strength of the soil, the potential of liquefaction, etc.,	pollution in the marine environment		[BT+BM:2x(4x60")]	**practice of making a script program about flow simulation in the earth.**		
14	[C4,P4,A4] construction materials, foundation structures, dams, etc.);	Case study	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	the accuracy of explaining	
15	[C4,P4,A4] Case study.	Case study	Discussion;	TM: 1x(3x50") [BT+BM:2x(4x60")]	Discussion **Exercises: Presentation and resume of geodynamic studies in geophysics**	the accuracy of explaining	
16	End Semester Evaluation						30%

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1. Telford, W.M; Geldart, L.P; Sheriff, R.E., 1998. Applied Geophysics. Cambridge Univ Press, Cambridge.
2. Zhdanov, M. S. and Keller, G. V., 1994. The Geoelectrical Methods in Geophysical Exploration. Elsevier
3. Ward, S. H. (ed.), 1990. Geotechnical & Environmental Geophysics, Soc. Expl. Geophys., 1032 pp,
4. McDowell P Wet *al, 2002*. ***Geophysics in engineering investigations, ciria***
5. Jurnal Geofisika

Program Study	Geophysical Engineering Department
Course	Seismic Data Processing and Acquisition
Cource Code	RF184625
Semester	VI (Six)
Credit	3 (T:2, P:1) SKS
Lecturer	Firman Syaifuddin, S.Si., M.T.

Study materials	Wave, Computation		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.1	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
		3.2	understanding geological knowledge that required to understand the geological process of a natural phenomenon by its characteristics;

		3.3	understanding the theoretical concept of statistics to define the process complexity of a natural phenomenon;
		3.5	understanding the concepts, principles and techniques of system design, process or application component of geophysical engineering in procedurally starting from data retrieval, processing, interpretation and modeling to solve the problems of geophysics engineering in deep;
		3.6	understanding the complete operational knowledge related to the field of geophysical engineering technology;
		3.8	understanding the principle and methods of mapping application that required in general geophysical engineering work;
		3.9	mastering the principles of quality assurance in general in geophysics engineering work;
		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
		3.11	mastering factual knowledge of current principles and issues in economic, socio-cultural and ecological issues in general that have an influence on the field of geophysics engineering;
		3.14	mastering general concepts, principles, and techniques of effective communication orally and in writing for specific purposes in general; and
		3.15	mastering factual knowledge about the development of cutting-edge technology and advanced materials in the field of geophysical engineering in deep

	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.3	being able to conduct research that includes identification, formulation, and analysis of geophysical engineering problems;
		4.4	being able to formulate alternative solutions to solve complex geophysical engineering problems by considering economic, health, public safety, cultural, social and environmental factors;
		4.5	being able to design systems, processes, and components with an analytical approach and consider technical standards, aspects of performance, reliability, ease of application, sustainability and pay attention to economic, health and public safety, cultural, social and environmental factors;
		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical

			exploration activities by paying attention to geological rules and exploration purposes;
		4.9	being able to recognize the difference of land and sea exploration field characteristics that can be affected into the quality of measurement data;
LO – Course	[C4,P4,A4] Students are able to make 2-dimensional and 3-dimensional seismic acquisition design, able to do seismic data processing (basic seismic processing)		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	[C4, P3,A3] Students are able to understand the concept of seismic exploration	1. Introduction to Lecture: • Semester Learning Plans • College Contracts • Scoring system Seismic Exploration Method	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50")	Discussion; Make a summary	Able to understand of seismic exploration	"5% Task"
2	[C3, P3,A3] Students are able to understand the concept of 2-	Design of 2-dimensional seismic refraction	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to create 2-dimensional seismic reflection and	"5% Task "

	dimensional refraction and reflection seismic design and are able to make 2-dimensional refraction and reflection seismic acquisition designs	and reflection acquisition				refraction acquisition designs	
3	[C4, P3,A3] Students are able to understand the concept of 3-dimensional reflection seismic design and are capable of making 3-dimensional reflection seismic acquisition design	3-dimensional seismic acquisition design	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to make 3-dimensional reflection seismic acquisition design	"5% Task "
4	[C3, P3,A3] Students are able to understand the concepts of land seismic and sea seismic acquisition	Land and sea seismic acquisition	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary **Quiz-01**	Able to understand of seismic exploration both land and sea environments	"5% Task " **15% Quiz**
5	[C4, P3,A3] Students are able to understand the operational concepts	Seismic operational data acquisition	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to plan seismic data acquisition operations	"5% Task "

	of land seismic and sea seismic acquisition						
6	[C4, P3,A3] Students are able to understand the concept of seismic data signal analysis and are able to do seismic data signal processing	Seismic data signal analysis	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Capable of analyzing seismic data signals	"5% Task "
7	[C3, P3,A3] Students are able to understand the concept of seismic data processing and are able to do it	Processing reflection seismic data	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to do 2-dimensional reflection seismic data processing	"5% Task "
8	Mid Semester Evaluation						40%
9	**[C3, P3,A3]** Students are able to understand the concept of pre-processing of seismic data and are able to analyze	Seismic data pre-processing	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to analyze data quality, perform geometric corrections and conduct seismic data conditioning before further processing	"5% Task "

10	**[C3, P3,A3]** Students are able to understand the concept of seismic data filtering and are able to do it	Filtering	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to filter seismic data	"5% Task "
11	[C3, P3,A3] Students are able to understand the concept of seismic data speed analysis and are able to do speed analysis and do the Normal Move Out correction	Velocity analysis	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to do seismic wave velocity analysis and Normal Move Out correction	"5% Task "
12	[C3, P3,A3] Students are able to understand the concept of seismic data migration and are able to process seismic data migration	Migrate seismic data	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary Quiz-02	Able to migrate seismic data	"5% Task "
13	[C3, P3,A3] Students are able understand the latest developments in seismic data	The latest data acquisition and processing technology	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Understanding the development of the latest seismic data processing technology	"5% Task"

	processing technology						
14	[C3, P3,A3] Students are able to understand the latest developments in seismic data processing technology	Case Study Reference Paper Study of literature from various sources	Group paper presentations, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Students are able to conduct paper reviews and understand their contents and are able to present the contents of existing papers	"5% Task "
15	[C3, P3,A3] Students are able to understand the latest developments in seismic data processing technology	Case Study Reference Paper Study of literature from various sources	Group paper presentations, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Students are able to conduct paper reviews and understand their contents and are able to present the contents of existing paper	"5% Task "
16	End Semester Evaluation						40%

REFERENCES :

1. Vermeer, G.J.O., “Fundamentals of 3-D seismic survey design.”, 2001
2. Costain, J. K. and Çoruh, C.,”Basic theory of exploration seismology.”, Elsevier, 2004.
3. Chapman, C.H., “Fundamentals of seismic wave propagation.”, Cambridge University Press, 2004.
4. Shearer, P.M. ,”Introduction to Seismology.”, Cambridge University Press,2009

Program Study	Geophysical Engineering Department
Course	Digital Electronics
Cource Code	RF184626
Semester	3 (T:2,P:1) SKS
Credit	VI (Six)
Lecturer	Mariyanto, S.Si., M.T.

Study materials	Electricity, Mathematics, Progamming		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.2	being able to show independent, quality, and measurable performance;
	Knowledge	3.4	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex

			engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
LO – Course	[C3,P3,A3] Students are able to know the theory of digital electronics also are able to demonstrate its application in the geophysics field.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Students are able to understand the system of quantities and number systems and their conversions	Understanding the quantity system and the number system and its conversion	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion	Liveliness of interact	-
2	Students are able to understand the characteristic of logic gates	Characteristic of Logic Gates	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion, Task	Task result	5%
3	Students are able to understand how logic gates work	How to work logic gates	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion	Liveliness of interact	-
4	Students are able to understand the	Boolean Algebra Theorem	Direct Lecture 120 minute	150 minute	Presentation, Discussion,	Quiz result	10%

	Boolean algebra theorem		Discussion 30 minute		quiz		
5	Students are able to apply the simplification method with the Karnaugh map	Simplification Method with the Karnaugh Map	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion, practicum	Practicum report	5%
6	Students are able to apply digital arithmetic operations	Digital Arithmetic Operations	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion, practicum	Practicum report	5%
7	Students are able to design digital arithmetic circuits	Digital Arithmetic Circuits	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion	Liveliness of interact	-
8	Evaluasi Tengah Semester						25%
9	Students are able to understand the characteristic of flip-flops	The characteristic of flip-flops	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion	Liveliness of interact	-
10	Students are able to understand how to work flip-flops	How to work a flip-flop	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion, Task	Task result	5%

11	Students are able to design a counter circuit	Counter Circuit	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion	Liveliness of interact	-
12	Students are able to design registrer circuits	Registrer Circuits	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion, quiz	Quiz result	10%
13	Students are able to design decoder circuits	Decoder Circuits	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion, practicum	Practicum report	5%
14	Students are able to design encoder circuits	Encoder Circuits	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion, practicum	Practicum report	5%
15	Students are able to design a multiplexer circuit	Multiplexer Circuit	Direct Lecture 120 minute Discussion 30 minute	150 minute	Presentation, Discussion	Liveliness of interact	-
16	Evaluasi Akhir Semester						25%

REFERENCES :

1. Ronald J. Tocci, Digital Systems Principles and Applications, Prentice-Hall int
2. M. Morris Mano, Digital Design, Prentice-Hall
3. Malvino Leach, Irwan Wijaya, Prinsip-Prinsip dan Penerapan Digital, Penerbit Erlangga
4. Roger L. Tokheim, Elektronika Digital, Penerbit Erlangga
5. Jurnal tentang elektronika digital

Program Study	Geophysical Engineering Department
Course	Groundwater Exploration
Cource Code	RF184627
Semester	VI (Six)
Credit	3 (T:2 P:1) SKS
Lecturer	Dr. Dwa Desa Warnana, S.Si., M.Si.

Study materials	Geoelectricity, Geology		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;

	Knowledge	3.2	understanding geological knowledge that required to understand the geological process of a natural phenomenon by its characteristics;
		3.3	understanding the theoretical concept of statistics to define the process complexity of a natural phenomenon;
		3.8	understanding the principle and methods of mapping application that required in general geophysical engineering work;
		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
		3.13	understanding the insight of sustainable development in applied geophysical exploration methods and natural resource management in general;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical

			exploration activities by paying attention to geological rules and exploration purposes;
		4.9	being able to recognize the difference of land and sea exploration field characteristics that can be affected into the quality of measurement data;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
		4.11	capable of reading maps and satellite imagery, determining map orientation in the field using GPS, compass and satellite data; and
		4.12	being able to criticize the complete operational procedures in solving the problems of geophysical engineering technology that has been and / or is being implemented and poured in the form of scientific papers.
LO – Course	[C4,P4,A4] Students are able to know the concepts and scope of work in groundwater exploration and mapping, geological conditions that are important in the formation of aquifer systems, physical and chemical properties of ground water to determine its quality, the basics of groundwater exploration techniques, mapping methods and water modeling soil		

Program Study	Geophysical Engineering Department
Course	Oil and Gas Geology
Course Code	RF184628
Semester	VI (Six)
Credit	3 (T:3) SKS
Lecturer	Dr. Ir. Amien Widodo, M.S.

Study Materials	Geology, Mechanics, Reservoir		
Learning Outcome (LO)	Attitude	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;

		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.2	understanding geological knowledge that required to understand the geological process of a particular natural phenomena by its characteristics;
		3.3	understanding the theoretical concept of statistics to define the process complexity of a particular natural phenomena;
		3.8	understanding the principle and methods of mapping application that required in general geophysical engineering work;
		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
		3.13	understanding the insight of sustainable development in applied geophysical exploration methods and natural resource management in general;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;

		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.9	being able to recognize the difference of land and sea exploration field characteristics that can be affected into the quality of measurement data;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
		4.11	capable of reading maps and satellite imagery, determining map orientation in the field using GPS, compass and satellite data; and
		4.12	being able to criticize the complete operational procedures in solving the problems of geophysical engineering technology that has been and / or is being implemented and poured in the form of scientific papers.
LO - Course	[C4,P4,A4] Students are able to understand the fundamentals of oil and gas availability in the crust along with the principles of exploration. Students are able to understand the concept of oil and gas formation and accumulation, petroleum systems, oil and gas exploration methods, and the regulation of oil and gas trade in Indonesia.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	2	3	4	5	6	7	8

1	[C4,P4,A4] Students are able to understand structural geology and Earth's constituent components(Earth Structure)	Introduction to Earth Structure [K1] : Earth Structure.ppt	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50”)	Discussion (Comprehension of Earth’s components from the core to the crust and its relation to structural geology)	the accuracy of explaining	
2	[C4,P4,A4] Students are able to understand crust deformations (Divergent, Convergent, and Transform)	Introduction to Crust Deformation [K2] : Tectonic Deformation Part 1.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion (types of tectonic crust movement); **Assignment-K2 : Resume on divergent, convergent, and transform process**	Get to know of the plate movements	
3	[C4,P4,A4] Students are able to explain the difference of Brittle and Ductile	Introduction to Brittle and Ductile on plate crust [K3] : Brittle and Ductile.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion (Brittle and Ductile); **Assignment-K3 :Latihan soal Brittle and Ductile Exercises, the difference of divergent, convergent, and transform**	Get to know the difference of Brittle and Ductile and the outcome structures from both	

4	[C4,P4,A4] Students are able to analyse the kinematics and dynamics of plate movement	The concept of kinematics and dynamics in structural geology [K4] : Force Kinematics.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion (Dynamics of Tectonic Plate); **Assignment-K4 : Resume of Plate Movement Kinematics**	Get to know the various types of plate movement from the dynamics of its kinematic force	
5	[C4,P4,A4] Students are able to understand carbonate sedimentary rock	The concept of sedimentary stratigraphy on carbonate sedimentary rock [K5] : Introduction to carbonate sedimentary rock.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion (carbonate sedimentary rock); **Quiz-K5 : Clastic Rock and Carbonate Rocks (components)**	Get to know of carbonate rocks component	
6	[C4,P4,A4] Students are able to understand the genesis of carbonate rocks (differences in clastic rocks genesis)	The concept of sedimentary stratigraphy on carbonate sedimentary rock [K5] : Introduction to carbonate rocks genesis.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion (plate dynamics in geophysics); **Assignment-K6 : carbonate rocks genesis exercises**	Get to know the genesis of carbonate rocks	

7	[C4,P4,A4] Students are able to understand the genesis of sedimentary rocks, the components, textures, structures, minerals, as well as explain the depositional environment and its classification	The concept of sedimentary stratigraphy on clastic and non-clastic rocks [K7] : Resume of sedimentary stratigraphy on clastic and non-clastic rocks.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion (clastic and non-clastic rocks); **Assignment-K7 : differences between clastic and non-clastic rocks exercise**	Get to know the differences between clastic and non-clastic rocks	
8	Mid Semester Evaluation						30%
9	[C4,P4,A4] Students are able to understand about stratigraphy and the laws of stratigraphy	Introduction to sedimentary stratigraphy, the principle of stratigraphy [K9] : Introduction to the principle of stratigraphy.ppt	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50”)	Discussion (the principle of stratigraphy);	Get to know the laws of stratigraphy	
10	[C4,P4,A4] Students are able to understand the differences in stratigraphic science (lithostratigraphy, chronostratigraphy, biostratigraphy)	Introduction to lithostratigraphy, chronostratigraphy, and biostratigraphy [K10] : Introduction to advanced stratigraphy.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion (comprehensive knowledge in stratigraphy); **Assignment-K10 : lithostratigraphy, chronostratigraphy, and biostratigraphy exercises**	the accuracy of explaining	5%

11	[C4,P4,A4] Students are able to analyse the correlation of rocks	The basic concept of sedimentary rocks correlations (understand datum/keybed) [K11] : rocks correlation.ppt	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	the accuracy of comparing and explaining	
12	[C4,P4,A4] Students are able to analyse the correlation of rocks (lithocorrelation, chronocorrelation, and biocorrelation)	Comprehension of the differences in lithocorrelation, chronocorrelation, and biocorrelation [K12] : lithocorrelation, chronocorrelation, and biocorrelation.ppt	Direct Lecture, Discussion, Video;	TM: 1x(3x50")	Discussion **Quiz-K12 : Stratigraphy and Correlation**	the accuracy of explaining	5%
13	[C4,P4,A4] Students are able to read a regional stratigraphy and its use	The basic concept of regional stratigraphy reading [K13] :Regional geology map.ppt	Direct Lecture, Discussion, Video;	TM: 1x(3x50") [BT+BM:2x(4x60")]	Discussion **Assignment -K13 : Practice on simulating the flow in the earth with program language**	the accuracy of explaining	10%
14	[C4,P4,A4] Students are able to understand the sequence stratigraphy	The concept of sequence stratigraphy [K14] : Introduction to Sequence Stratigraphy.ppt	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	the accuracy of explaining	

15	[C4,P4,A4] Students are able to understand a stratigraphy, correlation, and sequence of rocks	Comprehensive understanding of sedimentary stratigraphy [K15] : Journal.ppt	Discussion	TM: 1x(3x50") [BT+BM:2x(4x60")]	Discussion **Assignment-K15 : Presentation and resume about sedimentary stratigraphy**	the accuracy of explaining	
16	End Semester Evaluation						30%

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2. North F.K (1985), Petroleum Geology Allen & Unwin. London.Sydney
3. Magoon B.and Dow G.AAPG memoir no 60 1994. The Petroleum Systems from Source to Trap
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Program Study	Geophysical Engineering Department
Course	Geotourism
Course Code	RF184629
Semester	VI (Six)
Credit	3 (T:2,P:1) SKS
Lecturer	1.Dr. Ir. Amien Widodo, M.S. 2.Juan Pandu Gya Nur Rochman, S.Si., M.T.

Study Materials	Geology		
Learning Outcome (LO)	Attitude	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;

		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.1	understanding the theoretical concept of natural science and the principles of applying mathematical engineering as the basic methodology of geophysics exploration approach on a specific natural phenomena in general;
		3.6	understanding the complete operational insight related to geophysical engineering technology
		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
LO - Course	[C4,P4,A4] Students are able to analyse problems and geological potentials aspect which applicable for geotourism purposes and implement it for personal purpose or involve their surroundings including entrepreneurship purpose commercially.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)

1	2	3	4	5	6	7	8
1	[C4,P4,A4] Students are able to understand the concept of geotourism and its problems	Introduction to Geotourism as well as its development, problems, and obstacles [K1] : Introduction to Geotourism.ppt	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50")	Discussion	the accuracy of explaining	
2	[C4,P4,A4] Students are able to analyse the aspect of geology for tourism	Introduction to geological aspects and examples of its development [K2] : The aspects of geology and its development.ppt	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	the accuracy of explaining	
3	[C4,P4,A4] Students are able to analyse the aspect of geology for tourism	The forms, processes and activities of volcanoes, volcanic landscapes and its interesting aspects [K3] : Volcanoes Geotourism.ppt	Direct Lecture, Discussion, Video;	TM: 1x(3x50")	Discussion	the accuracy of explaining	

4	[C4,P4,A4] Students are able to analyse the aspect of geology for tourism	The forms, processes and activities of karst, karst landscapes and its interesting aspects [K3] : Karst Geotourism.ppt	Direct Lecture, Discussion, Video;	TM: 1x(3x50")	Discussion	the accuracy of explaining	
5	[C4,P4,A4] Students are able to analyse the aspect of stratigraphy and structural geology for tourism	Sedimentation profile, tectonics, and its interesting aspects [K5] : sedimentation and tectonics.ppt	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	the accuracy of explaining	
6	[C4,P4,A4] Students are able to analyse rivers and beaches for tourism	The systems of rivers, lakes, beaches, and sea	Direct Lecture, Discussion;	TM: 1x(3x50")	Diskusi **Quiz-K6**	the accuracy of explaining	10%
7	[C4,P4,A4] Students are able to analyse the aspects of geopark and its planning	Geopark UNESCO, Geotrack, promotion and socialization	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	the accuracy of explaining	
8	Mid Semester Evaluation						30%

9	[C4,P4,A4] Students are able to analyse the aspects of geotourism, do the simulation and planning	Geological Aspects of East Java	Discussion	[BT+BM:2x(3x60")]	Discussion	the accuracy of explaining	
10	[C4,P4,A4] Students are able to analyse the aspects of geotourism, do the simulation and planning	Geological Aspects of East Java	Discussion	[BT+BM:2x(3x60")]	Diskusi **Tugas-K10 :Resume Geowisata Jawa Timur**	the accuracy of explaining	5%
11	[C4,P4,A4] Students are able to analyse the aspects of geotourism, do the simulation and planning	Determination of rare, interesting, historical, and preservable geological aspects in East Java	Discussion	[BT+BM:2x(3x60")]	Presentation	the accuracy of explaining	10%
12	[C4,P4,A4] Students are able to analyse the aspects of geotourism, do the simulation and planning	East Java geotourism potential site visit -Mud Volcano -Sites	Field Discussion	TM: 1x(3x50") [BT+BM:2x(3x60")]	Discussion **Assignment-K12 : East Java Geotourism Resume**	the accuracy of explaining	5%

13	[C4,P4,A4] Students are able to analyse the aspects of geotourism, do the simulation and planning	East Java geotourism potential site visit -Post-mining -Geothermal -Volcanoes	Field Discussion	TM: 1x(3x50") [BT+BM:2x(3x60")]	Discussion **Assignment-K13 : East Java Geotourism Resume**	the accuracy of explaining	5%
14	[C4,P4,A4] Students are able to analyse the aspects of geotourism, do the simulation and planning	East Java geotourism potential site visit -Beaches, Rivers, Lakes -Karst	Field Discussion	TM: 1x(3x50") [BT+BM:2x(3x60")]	Discussion **Assignment-K13 : East Java Geotourism Resume**	the accuracy of explaining	5%
15	[C4,P4,A4] Students are able to analyse the aspects of geotourism, do the simulation and planning	Geotourism planning: Promotion, mapping, geotourism management planning	Guest Lecture	TM: 1x(3x50")	Discussion	the accuracy of explaining	
16	End Semester Evaluation						30%

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2. UNESCO, 2007, Guidelines and criteria for National Geoparks seeking UNESCO's assistance to joint the GlobalGeoparks Network.

3. Brahmantyo, B., 2006. Klasifikasi Geomorfologi. Laboratorium Geomorfologi Institut Teknologi Bandung, Bandung 4. Bemmelen, R.W. van, 1949, Geology of Indonesia, Vol. IA, Martinus Nijhoff, The Hague, Netherland. Bennet, M.R. & P. Doyle, 1996. In: M.R. Bennet, P. Doyle, J.G. Larwood & C.D. Prosser (Eds.). Geology on your doorstep. Geological Society London, 3-10. 5. Jurnal dan laporan studi kasus

Program Study	Geophysical Engineering Department
Course	Geophysical Instrumentation
Course Code	RF184630
Semester	3 (T:2, R:1) SKS
Credit	VI (Six)
Lecturer	

Study Materials	Electricity, Mathematics, Programming, Sensors, Geophysical instrumentation		
	Attitude	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;

Learning Outcome (LO)	**General Skills**	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.2	being able to show independent, quality, and measurable performance,
	Knowledge	3.4	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
LO - Course	[C3, P3, A3] Students are able to apply the work principle of instrumentation and application of electronic instrumentation related to geophysical methods.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	2	3	4	5	6	7	8

1	Students are able to understand the basic concept of instrumentation system	The basic concept of instrumentation system	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion	Activeness, interaction	-
2	Students are able to understand the concept of OP AMP (Operational Amplifier)	Op Amp (Operational Amplifier)	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion, assignment	Assignment result	5%
3	Students are able to understand the application of Op-amp for signal filtering	Op Amp (Operational Amplifier) for signal filtering	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion	Activeness, interaction	-
4	Students are able to understand the application of Op-amp for voltage and current adjustment	Op Amp (Operational Amplifier) for voltage and current adjustment	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion, quiz	Quiz result	10%
5	Students are able to understand the principle of sensor and transducer application	Sensor dan transducer	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion, practicum	Practicum result	5%

6	Students are able to understand the application of sensor and transducer	The application of sensor and transducer	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion, practicum	Practicum result	5%
7	Students are able to understand the application of Op-Amp and sensor	The application of Op Amp and sensor	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion	Activeness, interaction	-
8	Mid Semester Evaluation						25%
9	Students are able to understand the geoelectrical instrumentation	Geolectrical instrumentation	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion	Activeness, interaction	-
10	Students are able to understand the seismic instrumentation	Seismic instrumentation	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion, assignment	Assignment result	5%
11	Students are able to understand the magnetic instrumentation	Magnetic instrumentation	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion	Activeness, interaction	-

12	Students are able to understand the electromagnetic instrumentation	Electromagnetic instrumentation	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion, quiz	Quiz result	10%
13	Students are able to understand the gravitymetric instrumentation	Gravitymetric instrumentation	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion, practicum	Practicum report	5%
14	Students are able to understand the laboratory equipment instrumentation	laboratory equipment instrumentation	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion, practicum	Practicum report	5%
15	Students are able to understand the laboratory equipment instrumentation	laboratory equipment instrumentation	Direct Lecture 120 minutes Discussion 30 minutes	150 minutes	Presentation, discussion	Activeness, interaction	-
16	End Semester Evaluation						25%

Program Study	Geophysical Engineering Department
Course	Exploration Management
Cource Code	RF184631
Semester	VI (Six)
Credit	3 (T:3) SKS
Lecturer	Dr. Ayi Syaeful Bahri, S.Si., M.T.

Study materials	Geophysical exploration management concepts and functions: HR management functions, organization concepts and systems of exploration, arranging and managing teamwork, leadership and Human Resources, functions and planning processes; Planning techniques and methods; Assessing the feasibility of exploration / activities; Special Topic.

Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.1	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
		3.6	understanding the complete operational knowledge related to the field of geophysical engineering technology;
		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;

LO – Course	[C4,P4,A4] Able to applied and analyze a geophysical exploration activity with the aim of sustainability and efficiency (K3L) in exploration activities.

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	2	3	4	5	6	7	8
1	[C4,P4,A4] [Conceptual knowledge, analyze] Students are able to understand the Basic Concepts of Exploration Management	Introduction of the Method, Introduction of Exploration Management [K1]: Introduction of General Management	Introductory Lecture, contract and brainstorming;	TM: 2x(4x50")	Discussion; (applied and development of Modern Management); Task-K1: Make a resume about basics of field management	Get to know the basic concepts of management	5%
2	[C4,P4,A4][Conceptual knowledge, analyze]: Students are able to understand the Basic Concepts of Exploration Management	The Basic Concepts of Exploration Management	Direct Lecture, Discussion;	TM: 2x(4x50");	Discussion; (Basic concepts and principles of field management);	Accuracy of explanation	
3	[C4,P4,A4][Conceptual knowledge, analyze]: Mastering the concepts and functions of HR management	The concepts and functions of HR management	Direct Lecture, Discussion;	TM: 2x(4x50");	Discussion; (HR management concepts and functions);	The accuracy of comparing and explaining	

4	[C4,P4,A4][Conceptual knowledge, analyze]: Mastering the concepts and functions of HR management	The concepts and functions of HR management	Direct Lecture, Discussion;	TM: 2x(4x50");	Discussion; (HR management concepts and functions);	The accuracy of comparing and explaining	
5	[C4,P4,A4][Conceptual knowledge, analyze]: Being able to explain the theoretical concepts, HR management functions in the field	The concepts and functions of HR management	Direct Lecture, Discussion;	TM: 2x(4x50");	Presentation (case study) K2: The task of making a resume about the HR management function and presenting it (task per group one case study)	The accuracy of comparing and explaining	20%
6	[C4,P4,A4][Conceptual knowledge, analyze]: Being able to explain the theoretical concepts, HR management functions in the field	The concepts and functions of HR management	Direct Lecture, Discussion;	TM: 2x(4x50");	Presentation (case study)	The accuracy of comparing and explaining	
7	[C4,P4,A4][Procedural knowledge, analyze]: Mastering the concept of geophysical exploration organization and management system	Geophysical exploration organization and management system	Direct Lecture, Discussion;	TM: 2x(4x50");	Discussion; geophysical exploration organization and management system	The accuracy of comparing and explaining	
8	Mid Semester Evaluation						20%

9	[C4,P4,A4][Procedural knowledge, analyze]: Mastering the concepts, principles and techniques of 1D and 2D modeling in the resistivity method	Geophysical exploration organization and management system	Direct Lecture, Discussion;	TM: 2x(4x50”);	Discussion; geophysical exploration organization and management system	The accuracy of comparing and explaining	
10	[C4,P4,A4][Conceptual knowledge, analyze]: Mastering in compiling and managing teamwork	Organize and manage teamwork	Direct Lecture, Discussion;	TM: 2x(4x50”);	Discussion; Arrange and manage work teams	The accuracy of comparing and explaining	
11	[C4,P4,A4][Procedural knowledge, analyze]: Mastering the concept and application of leadership and Human Resources	The concept and application of leadership and Human Resources	Direct Lecture, Discussion;	TM: 2x(4x50”);	Discussion; Leadership and human resources	The accuracy of comparing and explaining	
12	[C4,P4,A4][Procedural knowledge, analyze]: Mastering the functions and planning processes of geophysical exploration	The concept and application of the geophysical exploration planning process	Direct Lecture, Discussion;	TM: 2x(4x50”);	Discussion; the applied of the geophysical exploration planning process	The accuracy of comparing and explaining	
13	[C4,P4,A4][Procedural knowledge, Analyze]:	The concept and application of geophysical	Direct Lecture, Discussion;	TM: 2x(4x50”);	Discussion; the applied of geophysical	The accuracy of comparing and explaining	

	Being able to know the worthiness of geophysical exploration activities	exploration activities			exploration activities		
14	[C4,P4,A4][Procedural knowledge, analyze]: Being able to know the worthiness of geophysical exploration activities	The concept and application of geophysical exploration activities	Direct Lecture, Discussion;	TM: 2x(4x50");	Discussion; the applied of geophysical exploration activities **Task K3: make a project per person (individual assignment) and present**	The accuracy of comparing and explaining	25%
15	[C4,P4,A4][Procedural knowledge, analyze]: Being able to know the worthiness of geophysical exploration activities	The concept and application of geophysical exploration activities	Direct Lecture, Discussion;	TM: 2x(4x50");	Discussion; the applied of geophysical exploration activities **Task K3: make a project per person (individual assignment) and present**	The accuracy of comparing and explaining	
16	End Semester Evaluation						30%

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2. Soeharto, Iman., Manajemen proyek: Dari Konseptual sampai Operasional, Erlangga, 1997.
3. Jurnal dan laporan studi kasus

Program Study	Geophysical Engineering Department
Course	Geographic Information Systems
Course Code	RF184632

Semester	VI (Six)
Credit	3 (Three) SKS
Lecturer	M.Singgih Purwanto, S.Si., M.T.

Study Materials	Mapping, Geology		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.8	understanding the principle and methods of mapping application that required in general geophysical engineering work;
	Specific Skills	4.11	capable of reading maps and satellite imagery, determining map orientation in the field using GPS, compass and satellite data; and
LO - Course	[C3,P3,A3] Students are able to apply the concept and application of GIS, able to develop GIS and manage spatial data using GIS technology.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	2	3	4	5	6	7	8
1	Students are able to understand the learning subjects in this lecture, Students are able to explain the scope of Geographic Information Systems in Geophysics	• GIS definition • GIS concept • Application of GIS in Geophysics	Direct Lecture Discussion	120 minutes 30 minutes	Discussion	Activeness in Discussion	
2 - 3	Students are able to understand The concept of Coordinate Systems and Transformation	• 2D and 3D Coordinate Systems • Map Projection : UTM, Mecartor	Direct Lecture Discussion	50 minutes 100 minutes	Presentation	1.Presentation layout format 2. Material Comprehension	5 % 10 %
4 - 5	Students are able to understand the data structure in GIS	• Spatial Data and its types • Data Attributes and its types	Direct Lecture Assignment	150 minutes 150 minutes	Assignment: getting example of spatial data and attributes	Suitability of the task with the results	5 %
6	Students are able to understand the input data in GIS. DEM data, and spatial operations	• Data from satellite image • Data topographic map	Direct Lecture Discussion	120 minutes 30 minutes	Discussion	Activeness in Discussion	

7	Students are able to explain map visualisation based on cartographic rules	• Scales • Legends • Map Format	Direct Lecture Assignment	150 minutes 150 minutes	Cartographic mapping	Suitability of the task with the results	5 %
8	**Mid Semester Evaluation**						25 %
9 - 10	Students are able to explain the data quality	• Vector Data • Raster Data	Direct Lecture Discussion	120 minutes 30 minutes	Discussion	Activeness in Discussion	
11 - 12	Students are able to conduct a simple analysis in GIS	• Spatial data analysis • Visual data analysis	Direct Lecture Discussion	120 minutes 30 minutes	Discussion	Activeness in Discussion	
13 - 14	Students are able to explain the concept of simple modelling in GIS	• correlate spatial data with data attribute	Direct Lecture Assignment	150 minutes 150 minutes	Cartographic mapping	Suitability of the task with the results	5 %
15	Students are able to make a simple map using GIS in Geophysics field	• Geothermal manifestations map	Presentation	150 minutes	Geothermal manifestation mapping	1.Presentation layout format 2. Material Comprehension 3.Suitability of the task with the results	15 %
16	**End Semester Evaluation**						30 %

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1. Puntodewo, Atie, Dkk.2003. Sitem Informasi Geografi Untuk Pengelolaan SDA. Center for International Forestry Research
2. Gorr, W. L. dan K. S. Kurland, 2008, GIS Tutorial Basic Workbook, ESRI Press.
3. Rolf, A. (editor), 2001, Principles of Geographic Information Systems, ITC Educational Textbook Series, ITC Enschede, The Netherlands.
4. Christman, N., 1997, Exploring Geographic Information Systems, John Wiley and Sons, New York.

Program Study	Geophysical Engineering Department
Course	Applied Seismology
Cource Code	RF184633
Semester	VI (Six)
Credit	3 (T:3) SKS
Lecturer	Firman Syaifuddin, S.Si., M.T.

Study materials	Wave, Geology

Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.1	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyze and design system, process, product, or component in geophysics engineering in deep;
		3.2	understanding geological knowledge that required to understand the geological process of a natural phenomenon by its characteristics;
		3.3	understanding the theoretical concept of statistics to define the process complexity of a natural phenomenon;
		3.4	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyze and design system, process, product, or component in geophysics engineering in deep;
		3.7	understanding the factual insights and technology application methods; codes and national/international standards as well as the

			regulations in force in his/her work area to carry out geophysical engineering technology work in depth;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.9	being able to recognize the difference of land and sea exploration field characteristics that can be affected into the quality of measurement data;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;

		4.12	being able to criticize the complete operational procedures in solving the problems of geophysical engineering technology that has been and / or is being implemented and poured in the form of scientific papers.
LO – Course	[C3,P3,A3] Students can apply seismology in engineering field, being able to make seismic zoning based on measurement data from microtremor and downhole seismic survey in determining Vs30. Being able to classify soil types based on geotechnical parameters.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	[C3, P3,A3] Understanding what will be learned in this lecture. Understanding the basic foundations of applied seismology.	1. Introduction to Lecture: • Semester Learning Plans • College Contracts • Scoring system 2. Review seismology courses	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50")	Discussion; Make a summary	Understanding what will be learned in this lecture Being able to explain the basic principles of applied seismology	"5% Task "
2	[C3, P3,A3] Understanding the concept of Ground Motion caused by earthquake events	Ground Motion	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Being able to explain the concept of Ground Motion caused by earthquake events	"5% Task "

3	[C3, P3,A3] Understand the concept of earthquake acceleration and the effects caused during an earthquake	Earthquake acceleration	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Being able to explain the concept of earthquake acceleration and the effects caused during an earthquake	"5% Task "
4	[C3, P3,A3] Knowing the concept of Seismic Zoning and microzonation	Seismic Zoning and microzonasi	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary **Quiz-01**	Being able to explain the concepts of Seismic Zoning and microzonation	"5% Task " **15% Quiz**
5	[C3, P3,A3] Knowing the concept of the local land effect on the destructive force caused by earthquake events	Local land effect	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Being able to explain the concept of the local land effect on the destructive force caused by earthquake events	"5% Task "
6	[C3, P3,A3] Able to classify soil types related to seismic activities	Classification of soil types	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to classify soil types related to seismic activities	"5% Task "
7	[C3, P3,A3]	Force due to earthquake	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion;	Being able to explain the	"5% Task "

	Able to explain the impact of an earthquake				Make a summary	impact of an earthquake	
8	Mid Semester Evaluation						40%
9	**[C3, P3,A3]** Knowing the concept and conducting Probabilistic Seismic Hazard Analysis	Probabilistic Seismic Hazard Analysis	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Knowing the concept and conducting Probabilistic Seismic Hazard Analysis	"5% Task "
10	**[C3, P3,A3]** Knowing the concept and conducting Deterministic Seismic Hazard Analysis	Deterministic Seismic Hazard Analysis	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Knowing the concept and conducting Deterministic Seismic Hazard Analysis	"5% Task "
11	[C3, P3,A3] Knowing the concepts of measurement, processing and interpretation of microtremor data	Microtremor	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to explain concepts and be able to measurements, processing and interpretation of microtremor data	"5% Task "
12	[C3, P3,A3] Knowing the concept of measuring,	Downhole seismic survey	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion;	Knowing the concept of measuring,	"5% Task "

	processing and interpreting Downhole seismic survey data				Make a summary **Quiz-02**	processing and interpreting Downhole seismic survey data	
13	[C3, P3,A3] Able to Interpretation of geotechnical data	Interpretation of geotechnical data	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to Interpretation of geotechnical data	"5% Task "
14	[C3, P3,A3] Knowing the seismic design concept of earthquake resistant buildings	Seismic design	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to explain the seismic design concept of earthquake resistant buildings	"5% Task "
15	[C3, P3,A3] Being able to analyze and prepare earthquake disaster mitigation documents	Earthquake disaster mitigation	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to analyze and prepare earthquake disaster mitigation documents	"5% Task "
16	End Semester Evaluation						40%

REFERENCES :

1. Maugeri, M, 2014, Earthquake Geotechnical Engineering Design, GEOTECHNICAL, GEOLOGICAL AND EARTHQUAKE ENGINEERING, Volume 28,Springer,London.
2. AKKAR, S., 2011, EARTHQUAKE DATA IN ENGINEERING SEISMOLOGY GEOTECHNICAL, GEOLOGICAL AND EARTHQUAKE ENGINEERING, Volume 14, Springer, London.
3. Yoshida, N., 2015, Seismic Ground Response Analysis, GEOTECHNICAL, GEOLOGICAL AND EARTHQUAKE ENGINEERING, Volume 36, Springer, London

Program Study	Geophysical Engineering Department
Course	Geothermal Exploration
Cource Code	RF184734
Semester	VII (Seven)
Credit	3 (T:3) SKS
Lecturer	Dr. Widya Utama. DEA

Study materials	Geophysics, Geology, Geochemistry		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.4	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;

		3.5	understanding the concepts, principles and techniques of system design, process or application component of geophysical engineering in procedurally starting from data retrieval, processing, interpretation and modeling to solve the problems of geophysics engineering in deep;
		3.6	understanding the complete operational knowledge related to the field of geophysical engineering technology;
		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
		3.12	understanding the concept, principle, workshop procedure, studio and laboratory activities, and Health and Safety Environment (HSE) in general;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;

		4.9	being able to recognize the difference of land and sea exploration field characteristics that can be affected into the quality of measurement data;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
		4.11	capable of reading maps and satellite imagery, determining map orientation in the field using GPS, compass and satellite data; and
		4.12	being able to criticize the complete operational procedures in solving the problems of geophysical engineering technology that has been and / or is being implemented and poured in the form of scientific papers.
LO – Course	[C3, A2, P3] Students are able to understand the total geothermal project work. Students are able to make a simple economic analysis and legal study of the development geothermal potential in the context of national energy empowerment. Students are able to do exploratory work order in the study of the geothermal potential area. Students are able to construct a simple conceptual model of a geothermal reservoir and evaluate the reservoir model also present it in the form of a geothermal energy prospect proposal that is usually used for completing IUP bidding documents at the Ministry of Energy and Mineral Resources.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	2	3	4	5	6	7	8
1	[C4,P4,A4] Students are able to understand the	Introduction to the EM Method, the development of the EM	Introductory Lecture, contract and brainstorming;	TM: 2x(4x50")	Discussion,	Get to know EM application in general	

	fundamental of Geothermal.	method and general applications K1: introduction to EM methods and their development.ppt					
2	[C4,P4,A4] Students are able to explain the importance of risk analysis of the development geothermal energy in an area.	Basic principles EM methods, Maxwell's Equation K2: Electric Field Equation, Magnetic Field and Maxwell Equation	Direct Lecture, Discussion;	TM: 1x(4x50”);	Discussion,	the accuracy of explaining	
3	[C4,P4,A4] Students are able to explain the processing of geological exploration data for preliminary studies of geothermal potential areas	Processing geological exploration data for preliminary studies of geothermal potential areas	Direct Lecture, Discussion;	TM: 1x(4x50”);	Discussion,	the accuracy of explaining	
4	[C4,P4,A4] Students are able to explain the processing of geological exploration data for preliminary studies of	Processing geological exploration data for preliminary studies of geothermal potential areas	Direct Lecture, Discussion;	TM: 1x(4x50”);	Discussion,	the accuracy of explaining	

	geothermal potential areas						
5	[C4,P4,A4] Students are able to apply geophysical exploration data processing to delineation of potential geothermal prospects	Processing geophysical exploration data for delineation of potential geothermal prospects	Direct Lecture, Discussion;	TM: 1x(4x50"); [BT+BM:2x(4x 60")]	Practicum	The accuracy of applying the suitable filter to improve the data quality	10%
6	[C4,P4,A4] Students are able to apply geophysical exploration data processing to delineation of potential geothermal prospects	Processing geophysical exploration data for delineation of potential geothermal prospects	Direct Lecture, Discussion;	TM: 1x(4x50")	Discussion,	the accuracy of explaining and comparing	10%
7	[C4,P4,A4] Students are able to explain the study of geology data	Study of geology data	Direct Lecture, Discussion;	TM: 1x(4x50"); [BT+BM:2x(4x 60")]	**Task 6**: make a resume paper using the CSAMT and AMT methods – (Practicum)	The accuracy of applying the suitable filter to improve the data quality	10%
8	Mid Semester Evaluation						30%
9	[C4,P4,A4]	Study of geology data	Direct Lecture, Discussion;	TM: 1x(4x50");	Discussion,	the accuracy of explaining	

	Students are able to explain the study of geology data						
10	[C4,P4,A4] Students are able to explain geothermal geophysics	Students are able to explain geothermal geophysics	Direct Lecture, Discussion;	TM: 1x(4x50");	Discussion,	the accuracy of explaining	
11	[C4,P4,A4] Students are able to explain geothermal geophysics	Students are able to explain geothermal geophysics	Direct Lecture, Discussion;	TM: 1x(4x50");	Discussion, Journal Resume	the accuracy of explaining	10%
12	[C4,P4,A4] Students are able to explain the geochemistry for the geothermal potential prospect area.	Geochemistry for the geothermal potential prospect area.	Direct Lecture, Discussion;	TM: 1x(4x50");	Discussion,	the accuracy of explaining	
13	[C4,P4,A4] Students are able to explain the geochemistry for the geothermal potential prospect area.	Geochemistry for the geothermal potential prospect area.	Direct Lecture, Discussion;	TM: 1x(4x50");	Discussion, Practicum	the accuracy of explaining	
14	[C4,P4,A4] Students are able to make an integrative study report for the	Making of an integrative study report on the prospects for the geothermal potential area.	Practicum	TM: 1x(4x50"); [BT+BM:2x(4x 60")]	Discussion, Practicum	the accuracy of explaining	

	geothermal potential prospects area.						
15	[C4,P4,A4] Students are able to make an integrative study report for the geothermal potential prospects area.	Making of an integrative study report on the prospects for the geothermal potential area	Practicum	TM: 1x(4x50”); [BT+BM:2x(4x 60”)]	Discussion, Practicum	the accuracy of explaining	
16	End Semester Evaluation				Report Presentation		30%

REFERENCES :

1. Handbook of Geothermal Energy,Editors: Edwards, L.M., Chilingar, G.V. et al. , Gulf Publishing Company, 1982, 613 pp.
2. Goff, F., Janik, C.J. (2000), Geothermal Systems, Editors: Haraldur Sigurdsson, Encyclopedia of Volcanoes, Academic Press, pp. 817-834

Program Study	Geophysical Engineering Department
Course	Geotomography
Cource Code	RF184735
Semester	VII (Seven)
Credit	4 (Four) SKS
Lecturer	Juan Pandu Gya Nur Rochman, S.Si., M.T.

Study materials	Programming, Geophysics		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.4	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
		3.5	understanding the concepts, principles and techniques of system design, process or application component of geophysical engineering in procedurally starting from

			data retrieval, processing, interpretation and modeling to solve the problems of geophysics engineering in deep;
		3.6	understanding the complete operational knowledge related to the field of geophysical engineering technology;
		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
		3.12	understanding the concept, principle, workshop procedure, studio and laboratory activities, and Health and Safety Environment (HSE) in general;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;

		4.9	being able to recognize the difference of land and sea exploration field characteristics that can be affected into the quality of measurement data;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
		4.11	capable of reading maps and satellite imagery, determining map orientation in the field using GPS, compass and satellite data; and
		4.12	being able to criticize the complete operational procedures in solving the problems of geophysical engineering technology that has been and / or is being implemented and poured in the form of scientific papers.
LO – Course	[C4, P3,A3] Students are able to apply the basic concepts of seismic and electric tomography imaging technology also create simple tomography programs.		

Week	**The Expected of Sub LO - Course**	**Learning Subject**	**Learning Methods**	**Assessment**		
				Criteria and Indicators	**Student's Learning Experience**	**Weight (%)**
1-2	Knowing what will be learned in this lecture, Being able to explain the scope of Geotomography studies	• Geotomography concept overview • Developmental History • The application	Lecture 120 minutes Discussion 30 minutes	• Liveliness in discussion • Task completion • Match the contents of the task	**Task 1:** Make a college resume 220 minutes Assignments and independent learning Response:	10%

					Make a resume for chapter 1 of the reference	
3-4	Understanding the basic concepts of the Seismic Tomography Method	• Metode Seismik Tomografi • Overview Parameterisasi Model and Inversi	Lecture 240 minutes Discussion 60 minutes	• Liveliness in discussion • Task completion • Match the contents of the task	**Task 2:** Make a college resume 220 minutes Assignments and independent learning	
5	Able to understand the theoretical concepts of the Transformation Technique Method, Fourier Projection Theorem, Back Projection and theorem Series Expansion Technique Method	• Transformation Techniques • Fourier theorem • Back Projection • Method of Series Expansion	Lecture 240 minutes Discussion 60 minutes	• Liveliness in discussion • Task completion • Match the contents of the task	**Task 3:** Make a college resume 220 minutes Assignments and independent learning **Quiz 1:**	
6-7	Able to do Forward Modeling in Seismic Tomography	• Ray Tracing • Bending Method • Full Wave Equation (Finite difference and finite element)	Lecture 240 minutes Discussion 60 minutes	• Liveliness in discussion • Task completion • Match the contents of the task	**Task 4:** Make a college resume 220 minutes Assignments and independent learning Forward Modeling Practicum	
8	**Mid Semester Evaluation (Formative Evaluation-Evaluation which is intended to improve the learning process based on the assessment that has been done)**					
9-10	Understanding the fundamental of inversion in Seismic Tomography.	• Seismic Inversion Tomography	Lecture 240 minutes Discussion	• Liveliness in discussion • Task completion	**Task 6:** Make a college resume 220 minutes	

		• Inversion of the Series Expansion Method (SVD and Gauss Newton) • Back Projection Technique (BPT)	60 minutes	• Match the contents of the task	Assignments and independent learning	
11-12	Understanding the SIRT method (Simultaneous Iterative Reconstruction Technique) and Algebraic Reconstruction Technique (ART) method.	• SIRT (Simultaneous Iterative Reconstruction Technique) • Algebraic Reconstruction Technique (ART)	Lecture 240 minutes Discussion 60 minutes	• Liveliness in discussion • Task completion • Match the contents of the task	**Task 7:** Make a college resume 220 minutes Assignments and independent learning	
13-14	Being able to apply the Seismic Tomography for global and regional scale.	Application of Seismic Tomography for depiction of a subduction zone	Lecture 240 minutes Discussion 60 minutes	• Liveliness in discussion • Task completion • Match the contents of the task	**Task 8:** Make a college resume 220 minutes Assignments and independent learning **Quiz 2:**	
15	Being able to understand the application of tomographic in Cross Hole Seismic, Electrical Resistance Tomography (ERT), VLF (Very Low Frequency)	• Tomography ERT (Electrical Resistivity Tomography) • Cross hole tomography of the tunnel case • Radar Tomography	Students present the results of a literature study **300** minutes	• Submission of material • Mastery of material • Active in discussion	Presentation	
16	**Final Semester Evaluation (Evaluation intended to find out the final achievement of student learning outcomes)**					

REFERENCES :

1. Wang, Y. “Seismic Amplitude Inversion in Reflection Tomography”, Elsevier science, 2003.
2. Iyer H.M. and Hirahara, K. (Ed.), 1993. Seismic Tomography: Theory and Practice. Chapman & Hall, London.
3. Nolet, G. (Ed.), 1987. Seismic Tomography with applications in global seismology and exploration geophysics. D. Reidel Publishing Company, Dordrecht.

Program Study	Geophysical Engineering Department
Course	Integrated Field Survey
Course Code	RF184736
Semester	VII (Seven)
Credit	4 (Four) SKS
Lecturer	

Study Materials	Geology, Geophysics		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.5	understanding the concepts, principles and techniques of system design, process or application component of geophysical engineering in procedurally starting from data retrieval, processing, interpretation and modeling to solve the problems of geophysical engineering in depth;

	Specific Skills	4.5	being able to design a system, process, and component by analytical approach and technical standard, performance aspect, reliability, simplicity of application, and sustainability consideration, also take heed on economic factors, public health and safety, cultural, social and environment;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
LO - Course	[C4,P4,A4] Students are able to compare exploration methods and integrate as well as conduct the methods in geological and geophysical field survey.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1- 2	Students are able to explain the resistivity 2D	1. Determine resistivity value distribution in research area 2. Determine the lithology of research area.	Practicum	1 x 50' 3 x 50'	Being able to Determine resistivity value distribution and the lithology in research area.	1.Subject comprehension 2.Suitability of the task and the result	10 %

3 - 4	Students are able to explain about Vertical Electrical Sounding (VES)	1. Determine resistivity value distribution in research area 2. Determine the lithology of research area.	Practicum	1 x 50' 3 x 50'	Being able to Determine resistivity value distribution and the lithology in research area.	1.Subject comprehension 2.Suitability of the task and the result	10%
5- 6	Students are able to explain the magnetic method	1. Determine susceptibility value of research area 2. Understand magnetic anomaly of mud volcano	Practicum	1 x 50' 3 x 50'	Being able to Determine susceptibility value and the lithology in research area.	1.Subject comprehension 2.Suitability of the task and the result	10%
7	Students are able to explain the seismic refraction method	Understand the wave arrival time on each layers	Practicum	1 x 50' 3 x 50'	Being able to understand the wave arrival time on each layers	1.Subject comprehension 2.Suitability of the task and the result	10%
8	Mid Semester Evaluation						10 %
9	Students are able to explain the seismic reflection method	Understand the wave arrival time on each layers	Practicum	1 x 50' 3 x 50'	Being able to understand the wave arrival time on each layers	1.Subject comprehension 2.Suitability of the task and the result	10 %

10 - 12	Students are able to explain VLF method	1. Understand rock structure in sub-surface 2. Understand conductivity effect on sub-surface structure.	Practicum	1 x 50' 2.x 50'	Being able to understand rock structure in sub-surface and conductivity effect on sub-surface structure.	1.Subject comprehension 2.Suitability of the task and the result	10 %
13 - 14	Students are able to explain microtremor method	Understand the characteristics of soil layers based on its dominant period/natural frequency parameters and wave amplification factors	Practicum	1 x 50' 3 x 50'	Being able to understand the characteristics of soil layers based on its dominant period/natural frequency parameters and wave amplification factors	1.Subject comprehension 2.Suitability of the task and the result	10 %
15	Students are able to explain the geology observation	1. Understand structural geology in research area 2. Understand local geology and regional geology of research area	Practicum	1 x 50' 3 x 50'	Being able to Understand structural geology, local geology and regional geology of research area	1.Subject comprehension 2.Suitability of the task and the result	10 %
16	End Semester Evaluation						10 %

REFERENCES :

1. Telford et al., Applied Geophysics, Cambridge Univ. Press, 1976
2. Reynolds, J.M., An Introduction to applied and environmental Geophysics. John Wiley and Sons, 1997.
3. Sheriff, R.E., dan L.P. Geldart, Exploration Seismology. Cambridge Univ. Press, 1995.
4. Grant & West, Interpretation Theory in Applied Geophysics, Mc. Graw-Hill Book Company, 1965.

Program Study	Geophysical Engineering Department
Course	Seminar
Cource Code	RF184737
Semester	VII (Seven)
Credit	2 (T:2) SKS
Lecturer	Dr. Widya Utama, DEA

Study materials	Scientific Writing, Language		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
	Knowledge	3.8	understanding the principle and methods of mapping application that required in general geophysical engineering work;
	Specific Skills	4.12	being able to criticize the complete operational procedures in solving the problems of geophysical engineering technology that has been and / or is being implemented and poured in the form of scientific papers;
LO – Course	[C3.P3,A3] Students are able to understand how to think scientifically, study topics for final assignments from national and international journals and present them in oral and scientific work papers.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	2	3	4	5	6	7	8

1	[C3.P3,A3] Students are able to understand scientific reports	[K1]: Lecture contract, introduction to scientific reports	Direct Lecture, Discussion, compare several writings and reports	TM: 1x(3x50")	Discussion	Accuracy in understanding the structure of scientific reports	
2	[C3.P3,A3] Students are able to understand the structure of scientific reports	[K2]: Structure of scientific reports	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	Accuracy in understanding the structure of scientific reports	
3	[C3.P3,A3] Students are able to understand Indonesian grammar in scientific reports	[K3]: Language with correct Indonesian structure	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion [Task 3]: arrange sentences that are standard and correct	Accuracy in understanding correct scientific report sentences in Bahasa.	10%
4	[C3.P3,A3] Students are able to understand English grammar in scientific reports	[K4]: English with the correct structure	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	Accuracy in understanding correct scientific report sentences in English	
5	[C3.P3,A3] Students are able to understand how to make good picture table illustrations in scientific reports	[K5]: Format table and picture	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	The accuracy of understanding	

6	[C3.P3,A3] Students are able to understand how to make good picture table illustrations in scientific reports	[K6]: Format table and picture	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	The accuracy of understanding	
7	[C3.P3,A3] Students are able to understand how to make good picture table illustrations in scientific reports	[K7]: Format table and picture	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	The accuracy of understanding	
8	**Mid Semester Evaluation**						30%
9	[C3.P3,A3] Students are able to apply Ms.Words in scientific reports	[K9]: Ms. Word optimization in making reports	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	The accuracy of understanding	
10	[C3.P3,A3] Students are able to compile of abstracts and introductory chapters	[K10]: Format abstract and introductory	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	The accuracy of understanding	
11	[C3.P3,A3] Students are able to compile a literature review and theoretical basis	[K11]: Format literature review and theoretical basis	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion [Task 11] : Make abstracts to the literature review chapter	The accuracy of understanding	10%

12	[C3.P3,A3] Students are able to compile the methodology chapter and research results	[K12]: Format of research methodology and results	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	The accuracy of understanding	
13	[C3.P3,A3] Students are able to compile references and citations	[K13]: Format bibliography and citations	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion [Task 13] : Create methodologies to bibliography	The accuracy of understanding	10%
14	[C3.P3,A3] Students are able to make publications	[K14]: Paper, journal and poster format	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion	The accuracy of understanding	
15	[C3.P3,A3] Students are able to make scientific presentations	[K15]: Scientific presentation format	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion [Task15] : make scientific presentations	The accuracy of understanding	10%
16	**End of Semester Evaluation (Proposal)**						30%

REFERENCES :

1. Briscoe, M.H., A guide to scientific illustrations
2. Cargill, M. dan O'Connor, P., Writing Scientific Research Article
3. Jurnal Kebumian

Program Study	Geophysical Engineering Department
Course	Mineral Deposit Exploration
Cource Code	RF184839
Semester	VIII (Eight)
Credit	3 (T:3) SKS
Lecturer	Anik Hilyah, S.Si., M.T.

Study materials	Geology, Mechanics, Mineral, Geophysics		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.2	understanding geological knowledge that required to understand the geological process of a natural phenomenon by its characteristics;
		3.3	understanding the theoretical concept of statistics to define the process complexity of a natural phenomenon;

		3.8	understanding the principle and methods of mapping application that required in general geophysical engineering work;
		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
		3.13	mastering the insights of sustainable development in the geophysical exploration methodologies and natural resource management;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.9	being able to recognize the difference of land and sea exploration field characteristics that can be affected into the quality of measurement data;

		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
		4.11	capable of reading maps and satellite imagery, determining map orientation in the field using GPS, compass and satellite data; and
		4.12	being able to criticize the complete operational procedures in solving the problems of geophysical engineering technology that has been and / or is being implemented and poured in the form of scientific papers.
LO – Course	[C4,P4,A4] Students can understand the fundamentals of exploration activities (concepts, models, principles, planning and exploration stages of mineral deposits), are able to integrate analysis up to the reserve estimation stage. Concept and models Mineral sediment exploration. The concept includes several mineral deposit genes. Exploration models include geological and geophysical models that are commonly used, for example: geological surveys, geoelectric, geomagnetic, induced polarized, drilling, gravity, seismic.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	2	3	4	5	6	7	8
1	[C4,P4,A4] Students are able to understand the geology structure and Earth Structure	Introduction to Earth Structure [K1]: Earth Structure.ppt	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50")	Discussion; (Understanding of the constituent components of the Earth from the core to the crust and the	the accuracy of explaining	

					relationship with the structural geology)		
2	[C4,P4,A4] Students are able to understand the Earth's crust deformation (Divergent, Convergent and Transform)	Introduction to Earth Crust Deformation [K2]: Tectonic Deformation Part 1.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion; (Various types of tectonic displacement crust); **Task-K2: Divergent, convergent, and transform process resumes**	Get to know Plate Movements	
3	[C4,P4,A4] Students are able to explain the differences between brittle and ductile	Introduction to Brittle and Ductile in plate crusts [K3]: Brittle and Ductile.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion; (Brittle and Ductile); **Task-K3: Exercise about Brittle and Ductile, Difference between Divergent Convergence and Transform**	Understand the difference between the Brittle and Ductile also the structure that results from both	

4	[C4,P4,A4] Students are able to analyze kinematics and dynamics in plate movements	The concepts of kinematics and dynamics in structural geology [K4]: Kinematics of Style.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion; (Plate tectonic dynamics); **Task-K4: Make a Plate Motion Kinematics Resume**	Get to know a variety of plate movements from kinematic force dynamics	
5	[C4,P4,A4] Students are able to understand carbonate sedimentary rocks	The concept of stratigraphic sedimentary carbonate sedimentary rocks [K5]: Introduction to carbonatan sedimentary rocks.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion; (carbonate sedimentary rocks); **Quiz-K5: Clastic and carbonate sediments (constituent components)**	Get to know the components of carbonate rocks	
6	[C4,P4,A4] Students are able to understand the carbonate rock genesis (differences with clastic sedimentary rocks)	The concept of stratigraphic sedimentary carbonate sedimentary rocks [K6]: Introduction to carbonate sedimentary rock genes.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion; (plate dynamics in geophysics); **Task-K6: Exercise about genesa carbonate sedimentary rock**	Get to know the genesa of carbonate sedimentary rocks	

7	[C4,P4,A4] Students are able to understand the origin of the sedimentary rock (genesis), its constituent components, texture, structure, minerals, then explain the depositional environment and its classification	The concept of stratigraphic sedimentary clastic and non-clastic sedimentary rocks [K7]: Resume stratigraphic sediment of clastic and non-clastic sedimentary rocks	Direct Lecture, Discussion;	TM: 1x(3x50") [BT+BM:2x(4x60")]	Discussion; (clastic and non-clastic sedimentary rocks); **Task-K7: Exercise about resume differences between clastic and non-clastic sedimentary rocks**	Knowing the differences between clastic and nonclastic sedimentary rocks	
8	**Mid Semester Evaluation**						30%
9	[C4,P4,A4] Students are able to understand the science of stratigraphy and the laws of stratigraphy	Introduction to stratigraphic sediments in the stratigraphic principle [K9]: Introduction to the principle of stratigraphy.ppt	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50")	Discussion; (stratigraphic principle);	Get to know the laws in stratigraphic science	
10	[C4,P4,A4] Students are able to understand the differences between lithostratigraphy,	Introduction to lithostratigraphy, chronostratigraph, and biostratigraphy	Direct Lecture, Discussion;	TM: 1x(3x50") [BT+BM:2x(4x60")]	Discussion; (understanding of stratigraphy); **Task-K10:**	the accuracy of explaining	5%

	chronostratigraphy, and biostratigraphy.	[K10]: Introduction to advanced stratigraphy.ppt			**Exercise about lithosphere, biostrat, and cronostrate**		
11	[C4,P4,A4] Students are able to analyze rock correlation	Basic concepts of sedimentary rock correlation (understanding datum / keybed) [K11]: rock correlation.ppt	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion;	the accuracy of explaining and comparing	
12	[C4,P4,A4] Students are able to analyze rock correlations (lithocorrelation, biocorrelation, and chronocorrelation)	Understanding of the differences between lithocorrelation, biocorrelation, and chronocorrelation [K12]: lithocorrelation, biocorrelation, chronocorrelation.ppt	Direct Lecture, Discussion;Video	TM: 1x(3x50”)	Discussion; **Quiz-K12 :Stratigraphy and Correlation**	the accuracy of explaining	5%
13	[C4,P4,A4] Students are able to read regional stratigraphy and its benefits	The basic concept of reading regional stratigraphy [K13]: Regional Geological Map.ppt	Direct Lecture, Discussion;Video	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion; **Task-K13: Exercise to make a programming language**	the accuracy of explaining	10%

					about flow simulation in the earth		
14	[C4,P4,A4] Students are able to understand the stratigraphic sequence	The concept of stratigraphic sequences [K14]: Introduction to stratigraphic sequences	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion;	the accuracy of explaining	
15	[C4,P4,A4] Students are able to understand Rock Stratigraphy, Rock Correlation, Rock Sequences	Comprehensive understanding of stratigraphic sediments [K15]: Jurnal.ppt	Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion; **Task-K15: Presentation and resume of stratigraphic sediments**	the accuracy of explaining	
16	**End Semester Evaluation**						30%

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2. Koesoemadinata, 2000, Geologi Eksplorasi
3. Peters, William C., 1978, Exploration and Mining Geology, John Wiley and Son
4. Telford, W.M., Geldart, L.P., Sherrif, R.E., 1990, Applied Geophysics, CambridgeUniv. Press.
5. Forrester, J.D., 1946, Principles of Field and Mining Geology, John Wiley and Son.

Program Study	Geophysical Engineering Department
Course	Passive Electromagnetic Exploration
Cource Code	RF184840
Semester	VIII (Eight)
Credit	3 (T:2,P:1) SKS
Lecturer	Wien Lestari, S.T., M.T.

Study materials	Wave, Mathematics, Geology		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.4	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
		3.5	understanding the concepts, principles and techniques of system design, process or application component of geophysical engineering in procedurally starting from

			data retrieval, processing, interpretation and modeling to solve the problems of geophysics engineering in deep;
		3.6	understanding the complete operational knowledge related to the field of geophysical engineering technology;
		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
		3.12	understanding the concept, principle, workshop procedure, studio and laboratory activities, and Health and Safety Environment (HSE) in general;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;

		4.9	being able to recognize the difference of land and sea exploration field characteristics that can be affected into the quality of measurement data;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
		4.11	capable of reading maps and satellite imagery, determining map orientation in the field using GPS, compass and satellite data; and
		4.12	being able to criticize the complete operational procedures in solving the problems of geophysical engineering technology that has been and / or is being implemented and poured in the form of scientific papers.
LO – Course	[C4,P4,A4] Students are able to understand the concepts, principles and techniques of system design, process or components of the Passive Electromagnetic Method (VLF, and MT) and carry them out procedurally starting from data collection, processing, analyzing the results of interpretation with subsurface geological conditions and modeling to solve geophysical engineering subsurface issue in mine exploration, hydrogeology, geotechnical engineering and the environment also responsible for the results of own work and groups through scientific reports and presentations.		

Week	**The Expected of Sub LO - Course**	**Learning Subject**	**Learning Methods**	**Time Estimation**	**Student's Learning Experience**	**Criteria and Indicators**	**Weight (%)**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	[C4,P4,A4] Students are able to understand the electromagnetic	Introduction to the EM Method, the development of the EM method and general applications	Introductory Lecture, contract and brainstorming;	TM: 2x(4x50")	Discussion;	Get to know EM applications in general	

	method (EM) and its development	K1: introduction to EM methods and their development.ppt					
2	[C4,P4,A4] Students are able to explain the concept of EM methods	Basic principles EM methods, Maxwell's Equation K2: Electric Field Equation, Magnetic Field and Maxwell Equation	Direct Lecture, Discussion;	TM: 1x(4x50”);	Discussion;	the accuracy of explaining	
3	[C4,P4,A4] Students are able to explain the concept of the EM-Magnetotelurik method	K3: Introduction to the magnetotelluric method, skin depth	Direct Lecture, Discussion;	TM: 1x(4x50”);	Discussion;	the accuracy of explaining	
4	[C4,P4,A4] Students are able to explain the processing of the Magnetotellurik method	K4: introduction of the data processing stages of the MT method	Direct Lecture, Discussion;	TM: 1x(4x50”);	Discussion;	the accuracy of explaining	
5	[C4,P4,A4] Students are able to apply processing Magnetotellurik method	K5: Case study, data processing	Direct Lecture, Discussion;	TM: 1x(4x50”); [BT+BM:2x(4x60”)]	Practicum	The accuracy of applying a good filter to improve data quality	10%

6	[C4,P4,A4] Students are able to explain the concept of CSAMT-AMT and apply Magnetotelurik processing methods	K6: Case study, data processing	Direct Lecture, Discussion;	TM: 1x(4x50")	Discussion;	the accuracy of explaining and comparing	
7	[C4,P4,A4] Students are able to explain the concept of CSAMT-AMT and apply Magnetotelurik processing methods	K7 : CSAMT and AMT data processing	Direct Lecture, Discussion;	TM: 1x(4x50"); [BT+BM:2x(4x60")]	Task 6: make a resume paper using the CSAMT and AMT methods -Practicum	The accuracy of applying a good filter to improve data quality	10%
8	Mid Semester Evaluation						30%
9	[C4,P4,A4] Students are able to explain the concept of Very Low Frequency	K9 : Introduction to the VLF method	Direct Lecture, Discussion;	TM: 1x(4x50");	Discussion;	the accuracy of explaining	
10	[C4,P4,A4] Students are able to explain the processing phase of Very Low Frequency	K10 : Introduction to the processing stages	Direct Lecture, Discussion;	TM: 1x(4x50");	Discussion;	the accuracy of explaining	
11	[C4,P4,A4] Students are able to explain the processing step of Very Low Frequency	K11 : Introduction to the step of modeling and development of the VLF method	Direct Lecture, Discussion;	TM: 1x(4x50");	Discussion; Journal Resumes	the accuracy of explaining	

12	[C4,P4,A4] Students are able to apply the passive electromagnetic method	K12 : The development of the MT method	Direct Lecture, Discussion;	TM: 1x(4x50”);	Guest Lecture	the accuracy of explaining	
13	[C4,P4,A4] Students are able to apply the passive electromagnetic method	K12 : The development of the MT method	Practicum	TM: 1x(4x50”);	Practicum	the accuracy of explaining	10%
14	[C4,P4,A4] Students are able to apply the passive electromagnetic method	K14 : The development of the MT method	Direct Lecture, Discussion;	TM: 1x(4x50”);	Guest Lecture	the accuracy of explaining	
15	[C4,P4,A4] Students are able to apply the EM VLF method	K14 : Introduction to the processing step	Practicum	TM: 1x(4x50”); [BT+BM:2x(4x60”)]	Discussion; practicum	the accuracy of explaining	10%
16	End Semester Evaluation				Report presentation		30%

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3. Zhdanov, M. S. (2009). Geophysical Electromagnetic Theory and Methods. Elsevier.
4. Simpson, F. and Bahr, K. (2005). Practical Magnetotelluric. Cambridge.
5. Jurnal Geofisika

Program Study	Geophysical Engineering Department
Course	Carbonate Exploration
Cource Code	RF184841
Semester	VIII (Eight)
Credit	3 (T:2,P:1) SKS
Lecturer	Dr. Ayi Syaeful Bahri, S.Si., M.T.

Study materials	Definition of carbonate rocks, types, classification and general properties of rocks, calculating / measuring physical parameters of carbonate rocks; porosity, permeability, resistivity / conductivity, bulk modulus, aturation, wetability, capillarity and carbonate rocks as other Nature Herritage		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.1	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
		3.2	understanding geological knowledge that required to understand the geological process of a natural phenomenon by its characteristics;

		3.8	understanding the principle and methods of mapping application that required in general geophysical engineering work;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.11	capable of reading maps and satellite imagery, determining map orientation in the field using GPS, compass and satellite data; and
		4.12	being able to criticize the complete operational procedures in solving the problems of geophysical engineering technology that has been and / or is being implemented and poured in the form of scientific papers.
LO – Course	[C4,P4,A3] Students are able to apply and integrate geophysical methods to explore the physical properties of carbonate rocks as typical rocks (Nature Herritage).		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	[C4,P4,A3] [Conceptual knowledge, Analyze] Students are able to understand the Carbonate Rock Classification	Introduction; Definition and classification of Carbonate Rocks [K1]: Introduction; Definition and	Introductory Lecture, contract and brainstorming; **(Task-K1: make a resume about the Carbonate Rock Classification and Definition)**	TM: 2x(4x50")	Discussion; (Carbonate Rock Classification and Definition); **Task-K1: Understanding the Carbonate Rock**	Knowing the Classification and Definition of Carbonate Rocks	5%

		classification of Carbonate Rocks			**Classification and Definition**		
2	[C4,P4,A3][Conceptual knowledge, Analyze]: Able to explain the theoretical concept of carbonate rocks form as sedimentary rocks	The basic principle of the carbonate rocks form as sedimentary rocks	Direct Lecture, Discussion;	TM: 2x(4x50");	Discussion; (Concepts and basic principles of carbonate sedimentary rock formation);	the accuracy of explaining	
3	[C4,P4,A3][Conceptual knowledge, Analyze]: Knowing the concepts and principles of Carbonate Rock Genesis and its depositional environment	Formation and carbonate depositional environments	Direct Lecture, Discussion;	TM: 2x(4x50");	Discussion; (Establishment Environment); **Task-K3: Understanding the Concept and Formation Environment**	the accuracy of explaining and comparing	5%
4	[C4,P4,A3][Conceptual knowledge, Analyze]: Knowing the general physical properties of rocks and carbonate rocks	Physical characteristics of rocks and carbonate rocks	Direct Lecture, Discussion;	TM: 2x(4x50");	Discussion; (General Concept of the Physical Properties of Rocks)	the accuracy of explaining and comparing	
5	[C4,P4,A3][Conceptual knowledge, Analyze]: Able to	Physical properties of rocks	Direct Lecture, Discussion;	TM: 2x(4x50");	Discussion; (Physical	the accuracy of explaining and comparing	

	explain the theoretical concepts of the physical properties of rocks				Properties of Rocks))		
6	[C4,P4,A3][Procedural knowledge, Analyze]: Able to explain the theoretical concepts of the physical properties of rocks	Physical properties of rocks	Direct Lecture, Discussion;	TM: 2x(4x50”);	Discussion; (Physical Properties of Rocks))	the accuracy of explaining and comparing	
7	[C4,P4,A3][Procedural knowledge, Analyze]: Able to explain the theoretical concepts of the physical properties of rocks	Physical properties of rocks	Direct Lecture, Discussion;	TM: 2x(4x50”);	Discussion; (Physical Properties of Rocks))	the accuracy of explaining and comparing	
8	Mid Semester Evaluation						20%
9	[C4,P4,A3][Procedural knowledge, Analyze]: Able to understand and take measurements of physical parameters of rocks	Measurement of the physical properties of rocks	The practice of measuring rock samples in a Laboratory / class	Kerja Kelompok 2x(4x50”);	Discussion; (Physical Properties of Rocks))	Accuracy in measuring, explaining and comparing rocks with their physical properties	

10	[C4,P4,A3][Conceptual knowledge, Analyze]: Able to understand and take measurements of physical parameters of rocks	Measurement of the physical properties of rocks	The practice of measuring rock samples in a Laboratory / class	Kerja Kelompok 2x(4x50");	Discussion; (Physical Properties of Rocks))	Accuracy in measuring, explaining and comparing rocks with their physical properties	
11	[C4,P4,A3][Procedural knowledge, Analyze]: Able to understand and take measurements of physical parameters of rocks	Measurement of the physical properties of rocks	The practice of measuring rock samples in a Laboratory / class	Kerja Kelompok 2x(4x50");	Group Work (Measurement of Physical Properties of Rocks)	Accuracy in measuring, explaining and comparing rocks with their physical properties	20%
12	[C4,P4,A3][Procedural knowledge, Analyze]: Able to understand and take measurements of physical parameters of rocks	Presentation per Group; Measurement Results Physical properties of rocks	Student Presentations in Classes	Kerja Kelompok 2x(4x50");	Group Work (Measurement of Physical Properties of Rocks)	Accuracy in measuring, explaining and comparing rocks with their physical properties	10%
13	[C4,P4,A3][Procedural knowledge, Analyze]: Knowing the concepts and principles of Carbonate Rock Genesis and its	The basic principle is the carbonate rocks form as sedimentary rocks	Carbonate Field Visit around Surabaya	Kuliah Lapangan 6x50"	Group Work per site or location (field lecture	Accuracy in observing in the field	

	depositional environment						
14	[C4,P4,A3][Procedural knowledge, Analyze]: Knowing the concepts and principles of Carbonate Rock Genesis and its depositional environment	The basic principle is the carbonate rocks form as sedimentary rocks	Carbonate Field Visit around Surabaya	Kuliah Lapangan 6x50"	Group Work per site or location (field lecture	Accuracy in observing in the field	
15	[C4,P4,A3][Procedural knowledge, Analyze]: Knowing the concepts and principles of Carbonate Rock Genesis and its depositional environment	The basic principle is the carbonate rocks form as sedimentary rocks	Carbonate Field Visit around Surabaya	Kerja Kelompok 2x(4x50");	Group Work per site or location (field lecture), Presented in Class	Accuracy in observing in the field	20%
16	End Semester Evaluation						20%

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Program Study	Geophysical Engineering Department
Course	Passive Seismic Exploration
Cource Code	RF184842
Semester	VIII (Eight)
Credit	3 SKS (T:2,P:1)
Lecturer	Firman Syaifuddin, S.Si., M.T.

Study materials	Wave, Geology		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.1	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;

		3.2	understanding geological knowledge that required to understand the geological process of a natural phenomenon by its characteristics;
		3.3	understanding the theoretical concept of statistics to define the process complexity of a natural phenomenon;
		3.4	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
		3.7	understanding the factual knowledge and technology application methods; national and international technical references (codes and standards) also regulations in their working area to carry out geophysical engineering technology work in depth;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;

		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.9	being able to recognize the difference of land and sea exploration field characteristics that can be affected into the quality of measurement data;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
		4.12	being able to criticize the complete operational procedures in solving the problems of geophysical engineering technology that has been and / or is being implemented and poured in the form of scientific papers.
LO – Course	[C3,P3,A3] Students can understand the phenomena of naturally generated sesimic waves caused by fluid movement in hydrocarbon and geothermal reservoirs. Students can take measurements of passive seismic methods and know the types of tools used as passive seismic wave vibration recorders. Students are able to do passive seismic method data processing to get a picture of subsurface conditions in the form of both reservoir and non-reservoir. Students are able to analyze the phenomena and geological processes that occur based on the interpretation of data on passive seismic methods.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	[C3, P3,A3] Understanding what will be learned in this lecture, understanding the basic foundations of the Passive Seismic method	Introduction to Lectures: • Semester Learning Plan • Lecture Contracts • Assessment System 2. Review seismology courses	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50")	Discussion; Make a summary	Understand what will be learned in this lecture Able to explain the basic of the Passive Seismic method	"5% Task"
2	[C3, P3,A3] Understanding the concept of surface waves	Surface wave	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to explain the concept of surface waves	"5% Task "
3	[C3, P3,A3] Understanding passive seismic wave recording instruments	Passive seismic wave recording instrument	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to explain the use of passive seismic wave recording instruments	"5% Task "
4	[C3, P3,A3] Knowing the concept of Geophone and its types	Geophone and its types	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary **Quiz-01**	Able to explain the concept of Geophone and its types	"5% Task " **15% Quiz**

5	[C3, P3,A3] Knowing the concept of Seismic Interferometry	Seismic Interferometry	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to explain the concept of Seismic Interferometry	"5% Task "
6	[C3, P3,A3] Able to do seismic interferometry data processing	Seismic interferometry data processing	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to do seismic interferometry data processing	"5% Task "
7	[C3, P3,A3] Able to interpret seismic interferometry data	Interpretation of seismic interferometric data	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to interpret seismic interferometric data	"5% Task "
8	**Mid Semester Evaluation**						40%
9	**[C3, P3,A3]** Knowing the concept of Microtremor	Microtremor	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to explain the concept of Microtremor	"5% Task "
10	**[C3, P3,A3]** Able to do data processing and Interpretation of Microtremor data	Microtremor data processing, Interpretation of Microtremor data	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to do data processing and Interpretation of Microtremor data	"5% Task "
11	[C3, P3,A3] Knowing the concepts of SASW and MASW	SASW and MASW	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to explain the concepts of SASW and MASW	"5% Task "

12	[C3, P3,A3] Able to do SASW and MASW data processing	SASW and MASW data processing	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary **Quiz-02**	Able to do SASW and MASW data processing	"5% Task "
13	[C3, P3,A3] Able to do Interpretation data of SASW and MASW	Interpretation data of SASW and MASW	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to do Interpretation data of SASW and MASW	"5% Task "
14	[C3, P3,A3] Knowing the concept of Passive Seismic Tomography	Passive Seismic Tomogrphy	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to explain the concept of Passive Seismic Tomography	"5% Task "
15	[C3, P3,A3] Able to do data analysis Passive Seismic Tomogrphy data processing and Interpretation of seismic passive data	Passive Seismic Tomography data processing Interpretation of seismic passive data	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to do data analysis Passive Seismic Tomogrphy data processing and Interpretation of seismic passive data	"5% Task "
16	**End Semester Evaluation**						40%

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5. Verdon, J. P., 2012, Microseismic Monitoring and Geomechanical Modelling of CO2 Storage in Subsurface Reservoirs, Springer-Verlag Berlin Heidelber

Program Study	Geophysical Engineering Department
Course	Archeology Geophysics
Course Code	RF184843
Semester	VIII (Eight)
Credit	3 (T:3) SKS
Lecturer	Juan Pandu Gya Nur Rochman, S.Si., M.T.

Study Materials	Wave, Mathematics, Geology		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.4	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;

		3.5	understanding the concepts, principles and techniques of system design, process or application component of geophysical engineering in procedurally starting from data retrieval, processing, interpretation and modeling to solve the problems of geophysical engineering in depth;
		3.6	understanding the complete operational knowledge related to the field of geophysical engineering technology;
		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
		3.12	understanding the concept, principle, workshop procedure, studio and laboratory activities, and Health and Safety Environment (HSE) in general;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;

		4.9	being able to recognize the difference of land and sea exploration field characteristics that can be affected into the quality of measurement data;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
		4.11	capable of reading maps and satellite imagery, determining map orientation in the field using GPS, compass and satellite data; and
		4.12	being able to criticize the complete operational procedures in solving the problems of geophysical engineering technology that has been and / or is being implemented and poured in the form of scientific papers.
LO - Course	[C4,P3,A3] Students are able to analyse using geophysical approach on archeology, paleo disaster, sedimentation and stratigraphy, radiocarbon dating, as well as apply and utilize geophysical methods on illustrating sub-surface condition in archeological field.		

Week	**The Expected of Sub LO - Course**	**Learning Subject**	**Learning Methods**	**Time Estimation**	**Student's Learning Experience**	**Criteria and Indicators**	**Weight (%)**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	[C4,P4,A4] Students are able to understand the fundamental of Archeology	Fundamentals of Archeology	Introductory Lecture, contract and brainstorming;	TM: 2x(4x50")	Discussion	Get to know the application of geophysics in archeology	
2	[C4,P4,A4]	Fundamentals of Geoscience	Direct Lecture, Discussion;	TM: 1x(4x50");	Discussion	the accuracy of explaining	

	Students are able to explain the geoscience approach in archeology	Approach in Archeology					
3	[C4,P4,A4] Students are able to explain the geoscience approach in archeology	Fundamentals of Geoscience Approach in Archeology	Direct Lecture, Discussion;	TM: 1x(4x50”);	Discussion	the accuracy of explaining	
4	[C4,P4,A4] Students are able to explain about Paleo Disaster	Paleo disaster	Direct Lecture, Discussion;	TM: 1x(4x50”);	Discussion	the accuracy of explaining	
5	[C4,P4,A4] Students are able to explain about Paleo Disaster	Paleo disaster	Direct Lecture, Discussion;	TM: 1x(4x50”); [BT+BM:2x(4x 60”)]	Discussion	The accuracy of applying the suitable filter to improve the data quality	10%
6	[C4,P4,A4] Students are able to explain the concept of Sedimentation Process and Stratigraphy	Sedimentation Process and Stratigraphy	Direct Lecture, Discussion;	TM: 1x(4x50”)	Discussion	the accuracy of explaining and comparing	10%

7	[C4,P4,A4] Students are able to explain the concept of Sedimentation Process and Stratigraphy	Sedimentation Process and Stratigraphy	Direct Lecture, Discussion;	TM: 1x(4x50"); [BT+BM:2x(4x 60")]	Assignment 6 : write a paper resume on CSAMT and AMT Methods - Practicum	The accuracy of applying the suitable filter to improve the data quality	10%
8	Mid Semester Evaluation						30%
9	[C4,P4,A4] Students are able to explain the concept of RadioCarbon Dating	Radiocarbon Dating	Direct Lecture, Discussion;	TM: 1x(4x50");	Discussion	the accuracy of explaining	
10	[C4,P4,A4] Students are able to explain the concept of Radiocarbon Dating	Radiocarbon Dating	Direct Lecture, Discussion;	TM: 1x(4x50");	Discussion	the accuracy of explaining	
11	[C4,P4,A4] Students are able to explain geophysics methods :GPR, VLF	K11 : Introduction to modelling steps and developments of VLF method	Direct Lecture, Discussion;	TM: 1x(4x50");	Discussion Journal Resume	the accuracy of explaining	10%
12	[C4,P4,A4] Students are able to explain the archeological methods by drone and camera	Archeological methods by drone and camera	Direct Lecture, Discussion;	TM: 1x(4x50");	Discussion	the accuracy of explaining	

13	[C4,P4,A4] Students are able to explain geophysics methods: Resistivity	Geophysical methods: Resistivity	Direct Lecture, Discussion;	TM: 1x(4x50");	Discussion Practicum	the accuracy of explaining	
14	[C4,P4,A4] Students are able to explain geophysics methods: Resistivity	Geophysical methods: Resistivity	Practicum	TM: 1x(4x50"); [BT+BM:2x(4x 60")]	Discussion Practicum	the accuracy of explaining	
15	[C4,P4,A4] Study Case	Study Case	Practicum	TM: 1x(4x50"); [BT+BM:2x(4x 60")]	Discussion Practicum	the accuracy of explaining	
16	End Semester Evaluation				Report Presentation		30%

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2. Holliday, V. T. (2004). Soils in Archaeological Research. New York, Oxford University Press. KEY REFERENCE FOR GEOARCHAEOLOGY OF SOILS
3. Stoops, G. and C. Nicosia, Eds. (2017). Archaeological Soil and Sediment Micromorphology. New York, Wiley and sons.

Program Study	Geophysical Engineering Department
Course	Marine Geophysics
Course Code	RF184844
Semester	VIII (Eight)
Credit	3 (T:3) SKS
Lecturer	1. Dr. Dwa Desa Warnana, S.Si., M.Si. 2. Wien Lestari, S.T., M.T.

Study Materials	Geology, Mathematics, Physics, Wave		
Learning Outcome (LO)	Attitude	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;

	Knowledge	3.1	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
		3.2	understanding geological knowledge that required to understand the geological process of a particular natural phenomena by its characteristics;
		3.5	understanding the concepts, principles and techniques of system design, process or application component of geophysical engineering in procedurally starting from data retrieval, processing, interpretation and modeling to solve the problems of geophysical engineering in depth;
		3.7	understanding the factual insights and technology application methods; codes and national/international standards as well as the regulations in force in his/her work area to carry out geophysical engineering technology work in depth;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.9	being able to recognize the difference between land and sea exploration field characteristics that can be affected into the quality of measurement data;
LO - Course	[C4, P4, A4] Students are able to design and integrate geophysics exploration acquisitions which suitable with the research object. Students are able to interpret seafloor geomorphology, anomaly or object under the sea level from geophysics data.		

Week	The Expected of Sub LO-Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience*	Criteria and Indicators	Weight (%)
1	2	3	4	5	6	7	8
1	[C4,P4,A4] Students are able to understand and master the development of geophysics exploration on the sea and shore	Introduction to Marine Geophysics, the development of marine geophysics and its applications [K1] : Introduction to Marine Geophysical Methods.ppt	Introductory Lecture, Brainstorming;	TM: 1x(3x50")	Discussion (application and development of marine geophysics exploration, problems, and strategy); Task-K1 :Resume on development of marine geophysics exploration	Get to know the geoelectrical methods applications in general;	5%
2	[C4,P4,A4] Students are able to understand and explain the geology and geomorphology of marine	Geology and oceanic plate history [K2] : Introduction to marine geology and geomorphology methods .ppt	Direct Lecture, Discussion ;	TM: 1x(3x50")	Discussion (marine geology and geomorphology); Task-K2 :marine structure and geomorphology analysis from geographic position	The accuracy of explaining	10%
3	[C4,P4,A4] Students are able to understand and explain the magnetic survey on the sea	Fundamentals of Marine Magnetic Survey [K3] : Marine magnetic survey.ppt	Direct Lecture, Discussion ;	TM: 1x(3x50")	Discussion (Marine magnetic survey);	The accuracy of explaining	

4	[C4,P4,A4] Students are able to explain the deepwater geohazard	The concept of deepwater geohazard [K4] : Introduction to deepwater geohazard.ppt	Direct Lecture, Discussion ;	TM: 1x(3x50")	Discussion (deepwater geohazard);	The accuracy of explaining	
5	[C4,P4,A4] Students are able to explain the Marine HSE Fundamentals	the Marine HSE Fundamentals [K5] : Introduction to marine HSE.ppt	Direct Lecture, Discussion ;	TM: 1x(3x50")	Discussion (marine HSE); Task-K5 :resume guest lecture	The accuracy of explaining	5%
6	[C4,P4,A4] Students are able to explain the Gravity method in marine Exploration	Gravity method in marine Exploration [K6] : marine gravity survey.ppt	Direct Lecture, Discussion ;	TM: 1x(3x50")	Discussion (marine gravity survey);	The accuracy of explaining	
7	[C4,P4,A4]Students are able to explain some investigations and inventions of geoscience theory on oceanic crust, heat flow modelling, and navigation system	Marine investigations development [K7] : Marine Geophysics Journal.ppt	Direct Lecture, Discussion ;	TM: 1x(3x50")	Discussion (Marine Geophysics Investigations); Task-K7 : Marine Geophysics Investigations related to geodynamics, magnetic and gravity presentation	The accuracy of explaining	10%
8	Mid Semester Evaluation						30%
9	[C4,P4,A4] Students are able to explain Seismology and	Fundamentals of Marine Seismic Methods [K9] : Marine Seismic Survey.ppt	Direct Lecture, Discussion ;	TM: 1x(3x50")	Discussion (Marine Seismic Methods);	The accuracy of explaining	

	seismic exploration in marine (deep water)						
10	[C4,P4,A4] Students are able to explain Seismology and seismic exploration in marine (deep water)	Marine seismic interpretation and modelling [K10] : seismic survey interpretation and its development.ppt	Direct Lecture, Discussion ;	TM: 1x(3x50”)	Discussion (Marine Seismic Methods);	The accuracy of explaining	
11	[C4,P4,A4] Students are able to explain geoelectric exploration in marine (deep water)	Fundamentals of Marine Geoelectric Methods [K11] : Marine Geoelectric Survey.ppt	Direct Lecture, Discussion ;	TM: 1x(3x50”)	Discussion (Marine Geoelectric Methods);	The accuracy of explaining	
12	[C4,P4,A4] Students are able to explain geoelectric exploration in marine (deep water)	Marine geoelectric interpretation and modelling [K12] : marine geoelectric survey interpretation and its development.ppt	Direct Lecture, Discussion ;	TM: 1x(3x50”)	Discussion (Marine Geoelectric Methods);	The accuracy of explaining	
13	[C4,P4,A4] Students are able to explain the application of mechanical wave on the sea	Fundamentals of mechanical wave application on the sea [K13] :marine survey using mechanical wave.ppt	Direct Lecture, Discussion ;	TM: 1x(3x50”) [BT+BM:2 x(4x60”)]	Practicum data survey mechanic wave	The accuracy of explaining	10%

14	[C4,P4,A4] Students are able to explain the application of mechanical wave on the sea	Marine survey using mechanical wave interpretation and modelling [K14] : marine survey using mechanic wave interpretation and its development.ppt	Direct Lecture, Discussion ;	TM: 1x(3x50”)	Discussion (mechanical wave application on the sea);	The accuracy of explaining	
15	[C4,P4,A4] Students are able to explain electromagnetic exploration in marine	Fundamentals of Marine electromagnetic methods [K15] : Marine electromagnetic survey.ppt	Direct Lecture, Discussion ;	TM: 1x(3x50”)	Discussion (Marine electromagnetic survey);	The accuracy of explaining	
16	End Semester Evaluation				Data processing		30%

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1. Reynolds, John M., 1997, An Introduction to Applied and Environmental Geophysics, John Wiley & Sons, England.
2. Jones, E. J. , 1999, Marine Geophysics, John Wiley & Sons.
3. Turcotte, D.L. , 1982, Geodynamics Application of continue Physics to geological Problems, John Wiley & Sons
4. Fowler, C.M.R. , 1990, The Solid Earth. Cambridge University Press.
5. Fu, L., and Cazenave, A., satellite altimetry and Earth sciences, Academic Press, 2001.

Program Study	Geophysical Engineering Department
Course	Environment Geophysics
Course Code	RF184845
Semester	VIII (Eight)
Credit	3 (T:3) SKS
Lecturer	Dr.Dwa Desa Warnana, M.Si.

Study Materials	Geologi, Lingkungan, Geofisika		
Learning Outcome (LO)	Attitude	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.4	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;

		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
		3.12	understanding the concept, principle, workshop procedure, studio and laboratory activities, and Health and Safety Environment (HSE) in general;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
LO - Course	[C4,P4,A4] Students are able to master the concept, principle, and technique of designing system, process, or component applied geophysics methods on environmental problems and execute it procedurally started from data acquisition, processing, analysing interpretation result with geological condition of subsurface and modelling for physical environment problem solving along with its mitigation in deep, also be responsible for own work and group work through science report and presentation.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	2	3	4	5	6	7	8
1	[C4,P4,A4] Students are able to understand the concept of environmental geophysics	Introduction	Introductory Lecture, lecture contract and brainstorming	TM: 1x(3x50")	Discussion	The accuracy of explaining	5%
2	[C4,P4,A4] Students are able to understand the various kinds of physical environmental pollution along with its mitigation	physical environmental pollution along with its mitigation	Introductory Lecture, lecture contract and brainstorming	TM: 1x(3x50") [BT+BM:2x(4x60")]	Discussion : Problems exercises	The accuracy of explaining	10%
3	[C4,P4,A4] Students are able to understand the quality of environment	the quality of environment	Introductory Lecture, lecture contract and brainstorming	TM: 1x(3x50") [BT+BM:2x(4x60")]	Discussion : Task-10: Problems exercises	The accuracy of explaining	10%
4	[C4,P4,A4] Students are able to understand the environmental geophysics techniques related to monitoring system	environmental geophysics techniques related to monitoring system	Introductory Lecture, lecture contract and brainstorming	TM: 1x(3x50") [BT+BM:2x(4x60")]	Discussion : Task-10: Problems exercises	The accuracy of explaining	10%

5	[C4,P4,A4] Students are able to understand the environmental geophysics techniques related to physical environmental pollution mitigation	environmental geophysics techniques related to physical environmental pollution mitigation	Introductory Lecture, lecture contract and brainstorming	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion : Task-10: Problems exercises	The accuracy of explaining	10%
6	[C4,P4,A4] Study Case	Study Case	Introductory Lecture, lecture contract and brainstorming	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion : Task-10: Problems exercises	The accuracy of explaining	10%
7	[C4,P4,A4] Study Case	Study Case	Introductory Lecture, lecture contract and brainstorming	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion : Task-10: Problems exercises	The accuracy of explaining	10%
8	Mid Semester Evaluation						30%
9	[C4,P4,A4] Students are able to conduct an environmental pollution mapping methods	physical environmental pollution along with its mitigation	Introductory Lecture, lecture contract and brainstorming	TM: 1x(3x50”)	Discussion	The accuracy of explaining	
10	[C4,P4,A4] Students are able to understand the hydrogeology methods	hydrogeology methods	Direct Lecture, Discussion;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion : Task-10: Problems exercises	The accuracy of explaining	5%

11	[C4,P4,A4] Students are able to analyse the pollution in the field	The concept and measurement of environmental pollution	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion	The accuracy of explaining and comparing	
12	[C4,P4,A4] Students are able to understand the terrestrial pollution	the terrestrial pollution	Direct Lecture, Discussion, Video;	TM: 1x(3x50”)	Discussion	The accuracy of explaining	5%
13	[C4,P4,A4] Students are able to understand the marine pollution	the marine pollution	Direct Lecture, Discussion, Video;	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion	The accuracy of explaining	10%
14	[C4,P4,A4] Study Case	Study Case	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion	The accuracy of explaining	
15	[C4,P4,A4] Study Case	Study Case	Discussion	TM: 1x(3x50”) [BT+BM:2x(4x60”)]	Discussion and Presentation	The accuracy of explaining	
16	End Semester Evaluation						30%

REFERENCES :

1. Telford, W., Geldart, L.P., and Sheriff, R. E. (1976). Applied Geophysics.Cambridge Univ Press, Cambridge.
2. Ward, S.H., Editor 1990, Geotechnical and Environmental Geophysics, SEG.
3. Davis, M.L. and Cornwell, D.A., 1991, Introduction to Environmental Engineering, McGraw Hill, Inc.5.
4. Jurnal Geofisika, Sedimentary, and Metamorphic,3 rd

Program Study	Geophysical Engineering Department
Course	Mining Geophysics
Cource Code	RF184846
Semester	VIII (Eight)
Credit	3 (Three) SKS
Lecturer	Anik Hilyah, S.Si., M.T.

Study materials	Mineral genesis, resource and reserve classification, sampling theory, application of gravity, radioactive, magnetic, seismic, geoelectric, electromagnetic and logging methods for mineral exploration. Reserve calculation. Various survey designs and methods for finding mineral deposits in various field conditions.		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.1	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
		3.2	understanding geological knowledge that required to understand the geological process of a natural phenomenon by its characteristics;
		3.5	understanding the concepts, principles and techniques of system design, process or application component of geophysical engineering in procedurally starting from

			data retrieval, processing, interpretation and modeling to solve the problems of geophysics engineering in deep;
		3.7	Understanding the factual knowledge and technology application methods; national and international technical references (codes and standards) also regulations in their working area to carry out geophysical engineering technology work in depth;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
LO – Course	[C4, P4, A4] Students are able to design and integrate various geophysical exploration acquisitions that are suitable for the target mineral. Students are able to interpret the characteristics fields that affect the sampling and interpret subsurface mineral conditions.		

Week	**The Expected of Sub LO - Course**	**Learning Subject**	**Learning Methods**	**Time Estimation**	**Student's Learning Experience**	**Criteria and Indicators**	**Weight (%)**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Knowing the application of geophysical methods in mining	▪ Example application of geophysical methods in mining	Direct Lecture and Discussion;	150 minutes	Discussion;	Students are able to know the types of mineral deposits and geophysical methods used	

2	Knowing the classification of resources and reserves	▪ Classification of resources and reserves according to SNI and other countries ▪ Relationship between the classification of resources and reserves with the stages of exploration	Direct Lecture and Discussion;	150 minutes	Discussion;	Students are able to classify resources and reserves	
3	Understanding the correct and accurate sampling method	▪ Sampling technique ▪ Sampling method	Direct Lecture and Discussion;	150 minutes	Discussion;	Students are able to apply the sampling method in according to geological conditions	
4	Quiz 1 (Formative Evaluation-Evaluation intended to improve the learning process based on the assessment that has been done)						15%
5	Understanding nickel deposit exploration	▪ Application of geophysical methods in nickel deposit exploration	Direct Lecture and Discussion;	150 minutes	Presentations, Discussions and assignments	Students are able to design surveys and interpret nickel deposits	10%
6	Understanding the exploration of iron deposits	▪ Application of geophysical methods in iron	Direct Lecture and Discussion;	150 minutes	Presentation and Discussion	Students are able to design surveys and	

		deposits exploration				interpret iron deposits	
7	Understanding the exploration of aluminum deposits	▪ Application of geophysical methods in aluminium deposits exploration	Direct Lecture and Discussion;	150 minutes	Presentation and Discussion	Mahasiswa mampu mendesain survei dan Students are able to design surveys and interpret aluminium deposits	
8	Mid Semester Evaluation (Formative Evaluation-Evaluation which is intended to improve the learning process based on the assessment that has been done)						25%
9	Understanding copper deposits exploration	▪ Application of geophysical methods in copper deposits exploration	Direct Lecture and Discussion;	150 minutes	Presentation and Discussion	Students are able to design surveys and interpret copper deposits	
10	Understanding lead deposits exploration	▪ Application of geophysical methods in lead deposits exploration	Direct Lecture and Discussion;	150 minutes	Presentation and Discussion	Students are able to design surveys and interpret lead deposits	
11	Understanding PGE deposits exploration	▪ Application of geophysical methods in PGE deposits exploration	Direct Lecture and Discussion;	150 minutes	Presentation and Discussion	Students are able to design surveys and interpret PGE deposits	

12	Understanding gold deposits exploration	▪ Application of geophysical methods in gold deposits exploration	Direct Lecture and Discussion;	150 minutes	Presentation and Discussion	Students are able to design surveys and interpret gold deposits	
13	Quiz 2 (Formative Evaluation-Evaluation intended to improve the learning process based on the assessment that has been done)						15%
14	Understanding diamond deposits exploration	▪ Application of geophysical methods in diamond deposits exploration	Direct Lecture and Discussion;	150 minutes	Presentations, Discussions and assignments	Students are able to design surveys and interpret diamond deposits	10%
15	Understanding radioactive deposits exploration	▪ Application of geophysical methods in radioactive deposits exploration	Direct Lecture and Discussion;	150 minutes	Presentation and Discussion	Students are able to design surveys and interpret radioactive deposits	
16	End Semester Evaluation (Evaluation intended to find out the final achievement of student learning outcomes)						25 %

REFERENCES :

1. Reynolds, John M., 1997, An Introduction to Applied and Environmental Geophysics, John Wiley & Sons, England.
2. Moon, Charles J., dkk, 2006, Introduction to Mineral Exploration, Blackwell Publishing, Australia.
3. Guilbert, John M., dkk, 2007, The Geology of Ore Deposits, Waveland Press Inc., US.
4. Everett, Mark E., 2013, Near-Surface Applied Geophysics, Cambridge University Press, UK.

Program Study	Geophysical Engineering Department
Course	Reservoir Geophysics
Cource Code	RF184847
Semester	VIII (Eight)
Credit	3 (T:2,P:1) SKS
Lecturer	Firman Syaifuddin, S.Si., M.T.

Study materials	Geology, Seismic		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.1	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyze and design system, process, product, or component in geophysics engineering in deep;

		3.2	understanding geological knowledge that required to understand the geological process of a natural phenomenon by its characteristics;
		3.3	understanding the theoretical concept of statistics to define the process complexity of a natural phenomenon;
		3.4	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyze and design system, process, product, or component in geophysics engineering in deep;
		3.7	understanding the factual knowledge and technology application methods; national and international technical references (codes and standards) also regulations in their working area to carry out geophysical engineering technology work in depth;
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;

		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.9	being able to recognize the difference of land and sea exploration field characteristics that can be affected into the quality of measurement data;
		4.10	being able to organize the data and present it again by utilizing information technology that suits their needs;
		4.12	being able to criticize the complete operational procedures in solving the problems of geophysical engineering technology that has been and / or is being implemented and poured in the form of scientific papers.
LO – Course	[C4,P4,A4] Students can understand the reservoir properties related to geological events and the presence of economic fluids. Students are able to do stratigraphic seismic analysis in interpreting seismic data. Students are able to integrate all reservoir data to be modeled.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	[C3, P3,A3] Understand what will be learned in this	1. Introduction to Lecture:	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50")	Discussion;	Understand what will be learned in this lecture	"5% Task "

	lecture. Understand the basics of reservoir properties	• Semester Learning Plans • College Contracts • Scoring system 2. Review property reservoir courses			Make a summary	Able to explain the basics of reservoir properties	
2	[C3, P3,A3] Understand the concepts of Sedimentation and Stratigraphy	Sedimentation and stratigraphy	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to explain the concepts of Sedimentation and stratigraphy	"5% Task "
3	[C3, P3,A3] Understand the concept of depositional environment and facies	depositional environment and facies	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to explain the concept of depositional environment and facies	"5% Task "
4	[C3, P3,A3] Knowing the concept of seismic stratigraphy	Seismic stratigraphy	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary **Quiz-01**	Able to explain the concept of Seismic stratigraphy	"5% Task " **15% Quiz**
5	[C3, P3,A3] Knowing the concept of Seismic Inversion	Seismic Inversion	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to explain the concept of Seismic Inversion	"5% Task "

6	[C3, P3,A3] Able to do Post-stack inversion	Post-stack inversion	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to do Post-stack inversion	"5% Task "
7	[C3, P3,A3] Able to do Pre-stack inversion	Pre-stack inversion	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to do Pre-stack inversion	"5% Task "
8	**Mid Semester Evaluation (Formative Evaluation-Evaluation that is intended to improve the learning process based on the assessment that has been done)**						40%
9	**[C3, P3,A3]** Knowing the concepts of AVO Concept	AVO concept	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to explain the concepts of AVO	"5% Task "
10	**[C3, P3,A3]** Knowing the AVO analysis	AVO analysis	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Knowing AVO analysis	"5% Task "
11	[C3, P3,A3] Knowing the statistical concepts used in reservoir modeling	Geostatistics	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to explain concepts and be able to carry out statistical analyzes used in	"5% Task "

						reservoir modeling	
12	[C3, P3,A3] Knowing the Kriging concept and be able to apply it in reservoir modeling	Kriging	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary **Quiz-02**	Able to explain the Kriging concept and be able to apply it in reservoir modeling	"5% Task "
13	[C3, P3,A3] Knowing the concept of Co-kriging and Gaussian simulation	Co-kriging and Gaussian simulation	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to explain the concept of Co-kriging and Gaussian simulation	"5% Task "
14	[C3, P3,A3] Knowing the concepts and be able to do static reservoir modeling	Static reservoir modeling	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to explain concepts and be able to do Static reservoir modeling	"5% Task "
15	[C3, P3,A3] Knowing the concepts and be able to do OOIP and OGIP volumetric evaluations	Volumetric evaluation of OOIP and OGIP	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Knowing the concepts and be able to do OOIP and OGIP volumetric evaluations	"5% Task "
16	**Final Semester Evaluation (Evaluation intended to find out the final achievement of student learning outcomes)**						40%

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2. PYRCZ,M. J., DEUTSCH, C. V., 2014, GEOSTATISTICAL RESERVOIR MODELING, Oxford University Press, New York
3. Darling, T., “Well Logging and Formation Evaluation”, Elsevier Inc., 2005.Zobin, V. M., 2012, Introduction to Volcanic Seismology, Elsevier, London, UK
4. Tiab, D. and Donaldson, E.C., “Petrophysics 2nd.”, Elsevier, 2004.
5. Asquith, G. B. And Krygowski, D., “Basic Well Log Analysis, 2nd”, American Association of Petroleoum Geologist, 2004.
6. Brown, A., “Interpretation of Three-Dimensional Seismic Data”, American Association of Petroleoum Geologist, 2004.
7. Sheriff, R. E., Exploration Seismology, Cambridge Univ. Press. 1995.
8. Avseth, P., Mukerji, T., and Mavko, G., “Quantitative Seismic Interpretation”, Cambridge University Press., 2005.Thorne Lay, Terry C. Wallace- Modern Global Seismology, Vol. 58-Academic Press (1995).

Program Study	Geophysical Engineering Department
Course	Interpretation of Seismic Data
Cource Code	RF184848
Semester	VIII (Eight)
Credit	3 (T:2, P:1) SKS
Lecturer	Firman Syaifuddin, S.Si., M.T.

Study materials	Seismic, Computing		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.1	understanding the theoretical concept of engineering sciences, engineering principles, and engineering design methods required to analyse and design system, process, product, or component in geophysics engineering in deep;
		3.2	understanding geological knowledge that required to understand the geological process of a natural phenomenon by its characteristics;

		3.3	understanding the theoretical concept of statistics to define the process complexity of a natural phenomenon;
		3.5	understanding the concepts, principles and techniques of system design, process or application component of geophysical engineering in procedurally starting from data retrieval, processing, interpretation and modeling to solve the problems of geophysics engineering in deep;
		3.6	understanding the complete operational knowledge related to the field of geophysical engineering technology;
		3.8	understanding the principle and methods of mapping application that required in general geophysical engineering work;
		3.9	mastering the principles of quality assurance in general in geophysics engineering work;
		3.10	understanding the concepts and principle of environmental preservation in general from geophysical engineering activities;
		3.11	mastering factual knowledge of current principles and issues in economic, socio-cultural and ecological issues in general that have an influence on the field of geophysics engineering;
		3.14	mastering general concepts, principles, and techniques of effective communication orally and in writing for specific purposes in general; and

		3.15	mastering factual knowledge about the development of cutting-edge technology and advanced materials in the field of geophysical engineering in deep
	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
		4.3	being able to conduct research that includes identification, formulation, and analysis of geophysical engineering problems;
		4.4	being able to formulate alternative solutions to solve complex geophysical engineering problems by considering economic, health, public safety, cultural, social and environmental factors;
		4.5	being able to design systems, processes, and components with an analytical approach and consider technical standards, aspects of performance, reliability, ease of application, sustainability and pay attention to economic, health and public safety, cultural, social and environmental factors;

		4.6	capable of selecting resources and utilizing geophysical engineering design and analysis tools based on appropriate information and computing technologies to perform geophysical engineering activities;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.9	being able to recognize the difference of land and sea exploration field characteristics that can be affected into the quality of measurement data;
LO – Course	[C4,P4,A4] Students can understand the phenomena of earthquake and are able to explain the concept of earthquake wave propagation. Students are able to determine the location of the earthquake source, the type of earthquake, and analyze the mechanism of earthquake occurrence. Students can understand the principles and application of earthquake monitoring equipment. Students can understand the basic concepts of seismology used in exploration.		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	2	3	4	5	6	7	8
1	[C4, P3,A3] Students are able to understand how the concept of subsurface mapping using geophysical methods and subsurface mapping with geological data	Introduction to Lecture: • Semester Learning Plans • College Contracts • Scoring system Subsurface Mapping	Introductory Lecture, contract and brainstorming;	TM: 1x(3x50")	Discussion; Make a summary	Able to do subsurface mapping	"5% Task""
2	[C3, P3,A3] Students are able to understand how the concept of basin formation and can distinguish them	Basin Analysis	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Capable of analyzing the types of basins	"5% Task""
3	[C4, P3,A3] Students are able to understand how the concept of petroleum system and its constituent components	Geology of Petroleum	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Capable of analyzing the types of petroleoum system concepts	"5% Task""
4	[C3, P3,A3]	Seismic Data Acquisition	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion;	Able to analyze the quality of	"5% Task""

	Students ae able to understand the concept of seismic data acquisition and can evaluate the quality of seismic data				Make a summary **Quiz-01**	seismic data and find out the misinterpretation traps caused by the effects of seismic data acquisition	**15% Quiz**
5	[C4, P3,A3] Students know the steps of seismic data processing and misinterpretation traps caused by errors in seismic data processing	Seismic Data Processing	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to analyze the quality of seismic data and find out the misinterpretation traps caused by the effects of seismic data processing	"5% Task""
6	[C4, P3,A3] Students know the concept of correlation between wells and are able seismic well-tie.	Correlation of well data Seismic well-tie	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to do well-tie seismic analysis	"5% Task""
7	[C3, P3,A3] Students know the concept of interpretation seismic data qualitatively and	Interpretation of Qualitative Seismic Data	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to do structural interpretation of seismic data	"5% Task""

	are able to do structural interpretation						
8	**Mid Semester Evaluation (Formative Evaluation-Evaluation that is intended to improve the learning process based on the assessment that has been done)**						40%
9	**[C3, P3,A3]** Students know the concept of stratigraphic interpretation seismic data and are able to interpret stratifraphy	Stratigraphic Interpretation Seismic Stratigraphy	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to do stratification analysis from seismic data	"5% Task""
10	**[C3, P3,A3]** Students know the concept of depositional environment and the concept of quantitative interpretation	Sedimentation Environment Quantitative Seismic Data Interpretation	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Being able to analyze the depositional environment from seismic data and be able to carry out quantitative interpretations	"5% Task""
11	[C3, P3,A3] Students know the concept of seismic attributes and seismic inversion	Seismic attributes Seismic inversion	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion; Make a summary	Able to do seismic attribute analysis and do seismic inversion	"5% Task""
12	[C3, P3,A3]	Depth Conversion & Velocity	Direct Lecture, Discussion;	TM: 1x(3x50”)	Discussion;	Able to do depth conversion	"5% Task""

	Students know the concept of velocity and the process of converting maps in the time domain into the depth domain				Make a summary **Quiz-02**		
13	[C3, P3,A3] Students are able to identify reservoir types and evaluate them	Reservoir Identification Reservoir Evaluation	Direct Lecture, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Able to identify reservoir types and evaluate	"5% Task""
14	[C3, P3,A3] Students are able to understand the development of the latest concepts and technologies in the interpretation of seismic data	Case Study Reference Paper	Group paper presentations, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Students are able to conduct paper reviews and understand their contents and are able to present the contents of existing papers	"5% Task""
15	[C3, P3,A3] Students are able to understand the development of the latest concepts and technologies in the interpretation of seismic data	Case Study Reference Paper Study of literature from various sources	Group paper presentations, Discussion;	TM: 1x(3x50")	Discussion; Make a summary	Students are able to conduct paper reviews and understand their contents and are able to present the contents of existing papers	"5% Task""

16	**Final Semester Evaluation (Evaluation intended to find out the final achievement of student learning outcomes)**	40%

REFERENCES :

1. Brown, A., “Interpretation of Three-Dimensional Seismic Data”, American Association of Petroleoum Geologist, 2004.
2. Sheriff, R. E., Exploration Seismology, Cambridge Univ. Press. 1995.
3. Avseth, P., Mukerji, T., and Mavko, G., “Quantitative Seismic Interpretation”, Cambridge University Press., 2005.Thorne Lay, Terry C. Wallace-Modern Global Seismology, Vol. 58-Academic Press,1995.

Program Study	Geophysical Engineering Department
Course	Internship
Cource Code	RF184849
Semester	VIII (Eight)
Credit	3 (Three) SKS
Lecturer	Anik Hilyah, S.Si., M.T.

Study materials	The application of geophysical knowledge and methods through internships in research institutions, private companies and government aims to increase knowledge and experience about the scope of geophysical work		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.5	understanding the concepts, principles and techniques of system design, process or application component of geophysical engineering in procedurally starting from data retrieval, processing, interpretation and modeling to solve the problems of geophysics engineering in deep;
		3.6	understanding the complete operational knowledge related to the field of geophysical engineering technology;
		3.7	understanding the factual knowledge and technology application methods; national and international technical references (codes and standards) also regulations in their working area to carry out geophysical engineering technology work in depth;

	Specific Skills	4.1	being able to apply the principles of mathematics, science and engineering principles into procedures, processes, systems or methodologies of geophysical engineering, to create or modify models in solving complex engineering problems in the fields of environment, settlement, marine and energy with the concept of sustainable development;
		4.2	being able to find the source of engineering problems through the process of investigation, analysis, interpretation of data and information based on the principles of geophysical engineering;
LO – Course	[C4,P3,A3] Students are able to apply geophysical exploration methods, combine geophysical and geological data to produce accurate interpretations and have skills in geological and geophysical field surveys.		

Week	**The Expected of Sub LO - Course**	**Learning Subject**	**Learning Methods**	**Time Estimation**	**Student's Learning Experience**	**Criteria and Indicators**	**Weight (%)**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Students are able to make internship proposals	Material that is relevant to the case study	Discussion;	100 minute	Presentation	Internship proposal	25%
2	Students are able to master a science or method to complete a case study	Material that is relevant to the case study	Internships in institutions / companies	1 month	Presentation	Ability to complete case studies	25%
3	Students are able to apply geophysical methods in a case study	Relevant geophysical methods	Discussion;	100 minute	Presentation	Students are able to master internship material.	25%

4	Students are able to make internship reports	Relevant geophysical methods	Discussion;	100 minute	Task	Internship report	25%

REFERENCES :

1. Reynolds, J.M., An Introduction to applied and environmental Geophysics. John Wiley and Sons, 1997.
2. Sheriff, R.E., dan L.P. Geldart, Exploration Seismology. Cambridge Univ. Press, 1995.
3. Grant dan West, Interpretation Theory in Applied Geophysics, Mc. Graw-Hill Book Company, 1965.
4. Jurnal Geophysics dan Jurnal Near Surface Geophysics

Program Study	Geophysical Engineering Department
Course	Geothermal Engineering
Cource Code	RF184851
Semester	VIII (Eight)
Credit	3 (T:3) SKS
Lecturer	Dr. Widya Utama. DEA

Study materials	Geology, Geophysics, Geochemistry		
Learning Outcome (LO)	**Attitude**	1.9	demonstrating attitude of responsibility on work in his/her field of expertise independently;
	General Skills	2.1	being able to apply logical, critical, systematic, and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise;
		2.7	being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his or her responsibility;
		2.8	being able to conduct self-evaluation process to work group under his or her responsibility, and able to manage learning independently;
	Knowledge	3.6	understanding the complete operational knowledge related to the field of geophysical engineering technology;
		3.7	Understanding the factual knowledge and technology application methods; national and international technical references (codes and standards) also

			regulations in their working area to carry out geophysical engineering technology work in depth;
	Specific Skills	4.5	being able to design systems, processes, and components with an analytical approach and consider technical standards, aspects of performance, reliability, ease of application, sustainability and pay attention to economic, health and public safety, cultural, social and environmental factors;
		4.7	being able to improve the performance, quality or quality of a process through testing, measurement of objects, work, analysis, interpretation of data in accordance with procedures and standards of geophysical exploration activities by paying attention to geological rules and exploration purposes;
		4.8	able to use the latest technology in carrying out geophysical engineering work in the field of environment, settlement, marine and energy;
LO – Course	[C3,P3,A3] Students understand geothermal exploitation, from well drilling to electricity generation and direct use		

Week	The Expected of Sub LO - Course	Learning Subject	Learning Methods	Time Estimation	Student's Learning Experience	Criteria and Indicators	Weight (%)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	[C3,P3,A3] Students are able to understand the concept of geothermal	the concept of geothermal	Introductory Lecture, contract and Brainstorming, Discussion;	TM: 2x(4x50")	Discussion,	Get to know EM applications in general	

2	[C3,P3,A3] Students are able to explain the importance of geothermal exploitation in risk analysis of developing geothermal energy in an area.	geothermal exploitation in the risk analysis of developing geothermal energy in an area.	Direct Lecture, Discussion;	TM: 1x(4x50”);	Discussion,	the accuracy of explaining	
3	[C3,P3,A3] Students are able to explain the hydrothermal system	hydrothermal system	Direct Lecture, Discussion;	TM: 1x(4x50”);	Discussion,	the accuracy of explaining	
4	[C3,P3,A3] Students are able to explain the hydrothermal system	hydrothermal system	Direct Lecture, Discussion;	TM: 1x(4x50”);	Discussion,	the accuracy of explaining	
5	[C3,P3,A3] Students are able to apply data processing for geothermal conceptual models	geothermal conceptual model	Direct Lecture, Discussion;	TM: 1x(4x50”); [BT+BM:2x(4x60”)]	Practicum	The accuracy of applying a good filter to improve data quality	10%
6	[C3,P3,A3] Students are able to apply data processing for geothermal conceptual models	geothermal conceptual model	Direct Lecture, Discussion;	TM: 1x(4x50”)	Discussion,	the accuracy of explaining and comparing	10%
7	[C3,P3,A3]	fluid studies (thermodynamics)	Direct Lecture, Discussion;	TM: 1x(4x50”); [BT+BM:2x(4x60”)]	Task 6: make a resume paper using	The accuracy of applying a good	10%

	Students are able to understand fluid studies (thermodynamics)				the CSAMT and AMT-Practicum methods	filter to improve data quality	
8	Mid Semester Evaluation						30%
9	[C3,P3,A3] Students are able to explain the geothermal well drilling and completion	geothermal well drilling and completion	Direct Lecture, Discussion;	TM: 1x(4x50”);	Discussion,	the accuracy of explaining	
10	[C3,P3,A3] Students are able to explain the geothermal well drilling and completion	geothermal well drilling and completion	Direct Lecture, Discussion;	TM: 1x(4x50”);	Discussion,	the accuracy of explaining	
11	[C3,P3,A3] Students are able to explain geothermal well testing	Students are able to explain geothermal geophysics	Direct Lecture, Discussion;	TM: 1x(4x50”);	Discussion, Journal resume	the accuracy of explaining	10%
12	[C3,P3,A3] Students are able to explain geothermal well testing	Students are able to explain geothermal geophysics	Direct Lecture, Discussion;	TM: 1x(4x50”);	Discussion,	the accuracy of explaining	
13	[C3,P3,A3] Students are able to explain the determination of resources and reserves	determination of resources and reserves	Direct Lecture, Discussion;	TM: 1x(4x50”);	Discussion, Practicum	the accuracy of explaining	

14	[C3,P3,A3] Students are able to understand steam production facilities and power plants	steam production facilities and power plants	Practicum	TM: 1x(4x50”); [BT+BM:2x(4x60”)]	Discussion, Practicum	the accuracy of explaining	
15	[C4,P4,A4] Students are able to determine electrical power and steam consumption	determination of electrical power and steam consumption	Practicum	TM: 1x(4x50”); [BT+BM:2x(4x60”)]	Discussion, Practicum	the accuracy of explaining	
16	End Semester Evaluation				Report presentation		30%

REFERENCES :

1. Nenny Miryani Saptadji (2001): Teknik Panas Bumi, Diktat Kuliah Prodi Teknik Perminyakan.
2. D’Sullivan M.J & McKibbin R. (1989) : Geothermal Reservoir Engineering, a Manual for Geothermal Reservoir Engineering Course at the Geothermal Institute – University of Auckland.