PORTFOLIO FOR
GEOPHYSICAL METHODS COURSE

SEMESTER 4 ACADEMIC YEAR 2019-2020

Course Coordinator:
Prof. Tjipto Prastowo, Ph.D

PHYSICS DEPARTMENT
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
THE STATE UNIVERSITY OF SURABAYA
2021

TABLE OF CONTENT

A. SEMESTER LEARNING ACTIVITY PLAN

A.1 COURSE IDENTITY

Module Name	Geophysical Methods
Module Level	Bachelor Degree
Course Code	N/A
Subheading	N/A
Course contained	N/A
Semester/Year	4/2
Module Coordinator	Prof. Tjipto Prastowo, Ph.D
Lecturer	Prof. Tjipto Prastowo, Ph.D
Language	Bahasa Indonesia
Course Classification	Elective
Teaching format/ The number of hours per week during semester	A weekly meeting in class for 2 'hours' of teaching (1 'hour' of teaching = 50 minutes)
Course Load	1 Course Unit = 3 workhours per week or 170 minutes per week with various activities as follows: • Class Activity: 50 minutes • Structured Learning: 60 minutes • Independent Learning: 60 minutes **2 Course Units = 6 workhours per week = 340 minutes per week**
Course Credit	2 Course Units
Pre-requisites	Basic Physics 1 and 2, Earth Physics
Course Learning Outcome	1. Demonstrating independent, creative and honest characters in doing student assignments, mid and final exams. 2. Understanding a systematic study on various methods commonly used in geophysical surveys for examination of sub-surface structures near and beneath the surface including measurements of physical anomalies in a local site. 3. Applying a geophysical method selected to identify characteristics of sub-surface structures near and beneath the surface in a surveyed site accurately. 4. Understanding differences in geophysical data collection and processing techniques between common geophysical methods in the framework of each method completes the other method and vice versa.
Course Content	Geophysical Methods examine the solid Earth as a complex, physical system with a layered structure having different characteristics between rock layers constituting the structure of the Earth that can possibly be determined during field surveys by data collection, acquisition, and processing. These involve the applications of geophyiscal methods and measurement techniques, using either

	a single or a combined method, to accurately detect the presence of a physical anomaly under investigation. In this context, the roles of both 2D and 3D modeling for sub-surface structure determination (located near and below the surface at depth) are vital in identifying and characterising a physical system examined. The methods discussed include gravity, seismic (reflection, refraction, tomography), magnetic, geoelectric, electromagnetic induction approaches.
Attributed soft skill	1. Oral communication skills in individual presentation 2. Collaborative work in a group of students
References and sources	1. Telford, M. W., Geldart, L. P., Sheriff, R. E. and Keys, D. A. 1990. Applied Geophysics. 2nd Edition. New York: Cambridge University Press, US. pp.1-744. 2. Blakely, R. J. 1995. Potential Theory in Gravity and Magnetic Applications. Cambridge: Cambridge University Press, UK. pp.1-512. 3. Hinze, W. J., von Frese, R. R. B. and Saad, A. H. 2013. Gravity and Magnetic Explorations: principles, practices, and applications. University Printing House: Cambridge University Press, UK. pp.1-512. 4. Reynolds, J. M. 1997. An Introduction to Applied and Environmental Geophysics. Chichester: John Wiley and Sons Ltd., UK. pp.1-711. 5. Glatzmaier, G. A. 2001. Convection in the core and the generation of the Earth's magnetic field. An American Museum of Natural History Book. The New Press, New York: US. pp.62-67. 6. Stein, S. and Wysession, M. 2003. An Introduction to Seismology, Earthquake, and Earth Structure. Malden, MA: Blackwell Publishing, US. pp.1-498. 7. Everett, M. E. 2013. Near-surface Applied Geophysics. 2nd Edition. New York: Cambridge University Press, US. pp.1-422. 8. Some power point files and/or course materials relevant to Geophysical Methods from the internet.

A.2 COURSE TOPICS

Class discussions involve the following learning materials:

1. Geophysics: science of the Earth, length and time scales in geophyiscs, field measurements in geophysics, geophysical methods
2. Gravity Method: sub-surface structures near and beneath the Earth's surface, density variation and vertically stratified rock layers in the crust, gravity survey, gravity anomaly, anomaly measurements in gravity survey
3. Seismic Method: seismic reflection, seismic refraction, seismic tomography, elasticity and rigidity variations of sub-surface structure near and beneath the surface, seismic

survey and corresponding measurements, seismic wave propagation, seismic energy release via tectonic and volcanic earthquakes, seismo-tectonic activity

4. Magnetic Method: the Earth as a giant magnetic source, geodynamo processes, the main field, secondary sources of magnetic field, susceptibility variation, magnetic stratification in the crustal rocks, magnetic survey, magnetic anomaly, magnetic anomaly measurements
5. Geoelectric Method: electricity of the Earth, resistivity and conductivity variations in a layered sub-surface structure beneath the surface, geoelectric survey, resistivity anomaly, conductivity anomaly, anomaly measurements
6. Electromagnetic Method: measurement techniques based on electromagnetic wave propagation into the ground with natural and artificial sources, electromagnetic induction, VLF and GPR methods for identification of sub-surface structure near the surface
7. Geophysical Methods in practice: errors in measurements, correction factors, data collection, data acquisition, data processing, data analysis
8. Video clips presentation on poster sessions

A.3 COURSE PROGRAM

	THE STATE UNIVERSITY OF SURABAYA **FACULTY OF MATHEMATICS AND NATURAL SCIENCES** **PHYSICS STUDY PROGRAM**					**Document Code**
SEMESTER LESSON PLAN						
NAME OF COURSE	**COURSE CODE**	**DISCIPLINE**	**COURSE UNIT**		**SEMESTER**	**DATE CREATED**
GEOPHYSICAL METHODS		EARTH PHYSICS	**T=2 units**	**P=?**	4 (four)	1 February 2020
AUTHORISATION	**AUTHOR**	**COURSE COORDINATOR**			**HEAD OF PHYSICS STUDY PROGRAM**	
PHYSICS DEPARTMENT	Prof. Tjipto Prastowo, Ph.D.	Prof. Tjipto Prastowo, Ph.D.			Prof. Dr. Munasir, M.Si.	

Learning Achievement	**Program Learning Outcome (PLO)**	
	PLO1	Students are able to demonstrate knowledge of Classical Physics and Modern Physics.
	PLO6	Students are able to improve their knowledge and continue their study in a higher education.
	PLO7	Students are able to communicate their ideas and/or research results through academic writing and speaking effectively.
	PLO10	Students are able to demonstrate good scientist manners, critical thinking and innovation skills in research and professional fields.
	Course Learning Outcome (CLO)	
	CLO-1	Demonstrating independent, creative and honest characters in doing student assignments, mid and final exams.
	CLO-2	Understanding a systematic study on various methods commonly used in geophysical surveys for examination of sub-surface structures near and beneath the surface including measurements of physical anomalies in a local site.
	CLO-3	Applying a geophysical method selected to identify characteristics of sub-surface structures near and beneath the surface in a surveyed site accurately.
	CLO-4	Understanding differences in geophysical data collection and processing techniques between common geophysical methods in the framework of each method completes the other method and vice versa.
	Final competence in each step of learning (Sub-CLO)	
	Sub-CLO1	Being able to understand the importance of geophysics, length and time scales in geophyics, geophysical methods and techniques used in field measurements.
	Sub-CLO2	Being able to understand gravity method, heterogeneity in rock layers and minerals inside the Earth, vertical variation of density, identification of anomaly in gravity for examination of sub-surface structures near and beneath the surface.
	Sub-CLO3	Being able to understand seismology being part of science examining seismic wave propagation within the body of the Earth near and at the surface, various seismic methods (reflection, refraction, tomography), mechanisms of seismic energy release

		through earthquakes, differences in events of tectonic or volcanic origin, field surveys and corresponding measurements.
	Sub-CLO4	Being able to understand geodynamo processess in the Earth's outer core as the production of geomagnetic field, rock magnetism and mineral magnetics, secondary magnetic fields, susceptibility variation in rock layers, magnetic anomaly, survey methods and measurements of magnetic anomaly.
	Sub-CLO5	Being able to understand electricity in the Earth's crust, natural dan artificial sources of geoelectric method, resistivity and conductivity as two electric parameters, Wenner configuration, Schlumberger configuration, Wenner-Schlumberger configuration.
	Sub-CLO6	Being able to understand differences in geophysical measurement techniques between natural and artificial sources, a combined method of magnetic and electric approaches or in the form of electromagnetic induction, VLF dan GPR methods for identification of physical structures near the surface.
	Sub-CLO7	Being able to understand varying surveys and measurement techniques in applied geophysics for exploration of natural resources or other sources that are relevant.
	Sub-CLO8	Being able to create a poster relevant to lecture materials in Geophysical Methods.
Course Content	Geophysical Methods examine the solid Earth as a complex, physical system with a layered structure having different characteristics between rock layers constituting the structure of the Earth that can possibly be determined during field surveys by data collection, acquisition, and processing. These involve the applications of geophyiscal methods and measurement techniques, using either a single or a combined method, to accurately detect the presence of a physical anomaly under investigation. In this context, the roles of both 2D and 3D modeling for sub-surface structure determination (located near and below the surface at depth) are vital in identifying and characterising a physical system examined. The methods discussed include gravity, seismic (reflection, refraction, tomography), magnetic, geoelectric, electromagnetic induction approaches.	
Topic Discussions: Learning Materials	1. Geophysics: science of the Earth, length and time scales in geophyiscs, field measurements in geophysics, geophysical methods 2. Gravity Method: sub-surface structures near and beneath the Earth's surface, density variation and vertically stratified rock layers in the crust, gravity survey, gravity anomaly, anomaly measurements in gravity survey 3. Seismic Method: seismic reflection, seismic refraction, seismic tomography, elasticity and rigidity variations of sub-surface structure near and beneath the surface, seismic survey and corresponding measurements, seismic wave propagation, seismic energy release via tectonic and volcanic earthquakes, seismo-tectonic activity 4. Magnetic Method: the Earth as a giant magnetic source, geodynamo processes, the main field, secondary sources of magnetic field, susceptibility variation, magnetic stratification in the crustal rocks, magnetic survey, magnetic anomaly, magnetic anomaly measurements 5. Geoelectric Method: electricity of the Earth, resistivity and conductivity variations in a layered sub-surface structure beneath the surface, geoelectric survey, resistivity anomaly, conductivity anomaly, anomaly measurements 6. Electromagnetic Method: measurement techniques based on electromagnetic wave propagation into the ground with natural and artificial sources, electromagnetic induction, VLF and GPR methods for identification of sub-surface structure near the surface 7. Geophysical Methods in practice: errors in measurements, correction factors, data collection, data acquisition, data processing, data analysis 8. Video clips presentation on poster sessions	
References	**Primary:**	
	1. Telford, M. W., Geldart, L. P., Sheriff, R. E. and Keys, D. A. 1990. Applied Geophysics. 2nd Edition. New York: Cambridge University Press, US.	

	pp.1-744. 2. Blakely, R. J. 1995. Potential Theory in Gravity and Magnetic Applications. Cambridge: Cambridge University Press, UK. pp.1-512. 3. Hinze, W. J., von Frese, R. R. B. and Saad, A. H. 2013. Gravity and Magnetic Explorations: principles, practices, and applications. University Printing House: Cambridge University Press, UK. pp.1-512. 4. Reynolds, J. M. 1997. An Introduction to Applied and Environmental Geophysics. Chichester: John Wiley and Sons Ltd., UK. pp.1-711. 5. Glatzmaier, G. A. 2001. Convection in the core and the generation of the Earth's magnetic field. An American Museum of Natural History Book. The New Press, New York: US. pp.62-67. 6. Stein, S. and Wysession, M. 2003. An Introduction to Seismology, Earthquake, and Earth Structure. Malden, MA: Blackwell Publishing, US. pp.1-498. 7. Everett, M. E. 2013. Near-surface Applied Geophysics. 2nd Edition. New York: Cambridge University Press, US. pp.1-422.
	Secondary:
	Some power point files and/or course materials relevant to Geophysical Methods from the internet
Lecturers	Prof. Tjipto Prastowo, Ph.D.
Pre-requisites	Basic Physics 1 and Basic Physics 2

Week	**Final competence in each learning step (Sub-CLO)**	**Assessment**		**Learning Format, Methods, Instruction, (Time Allocation)**		**Learning Materials**	**Proportion (%)**
		Indicator	**Criteria & Format**	***offline***	***online***		
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
1	Being able to understand the importance of geophysics, length and time scales in geophyics, geophysical methods and techniques used in field measurements	Students can explain the importance of geophysics, length and time scales in geophyics, geophysical methods and techniques used in field measurements			Contextual Learning Discussion Q & A	• Geophysics: science of the Earth • Length and time scales in geophyiscs • Field measurements in geophysics • Geophysical Methods	
2	Being able to understand	Students can	Description on		Contextual Learning	• Gravity Method	

	gravity method, heterogeneity in rock layers and minerals inside the Earth, vertical variation of density, identification of anomaly in gravity for examination of sub-surface structures near and beneath the surface	explain gravity method, heterogeneity in rock layers and minerals inside the Earth, vertical variation of density, identification of anomaly in gravity for examination of sub-surface structures near and beneath the surface	student assignments: 1. Thematic ppt file (by a group of study) describing issues in one of Geophysical Methods 2. Individual presentation on the relevant ppt file		Discussion Q & A	• Sub-surface structures near and beneath the Earth's surface • Density variation and vertically stratified rock layers in the crust • Gravity survey • Gravity anomaly • Anomaly measurements in gravity survey	
3	Being able to understand seismology being part of science examining seismic wave propagation within the body of the Earth near and at the surface, various seismic methods (reflection, refraction, tomography), mechanisms of seismic energy release through earthquakes, differences in events of tectonic or volcanic origin, field surveys and corresponding measurements	Students can explain seismology being part of science examining seismic wave propagation within the body of the Earth near and at the surface, various seismic methods (reflection, refraction, tomography),			Contextual Learning Discussion Q & A	• Seismic Method • Seismic reflection • Seismic refraction • Seismic tomography • Elasticity and rigidity variations of sub-surface structure near and beneath the surface • Seismic survey and corresponding measurements • Seismic wave propagation • Seismic energy release via tectonic and volcanic	

		mechanisms of seismic energy release through earthquakes, differences in events of tectonic or volcanic origin, field surveys and corresponding measurements				earthquakes • Seismo-tectonic activity	
4	Being able to understand seismology being part of science examining seismic wave propagation within the body of the Earth near and at the surface, various seismic methods (reflection, refraction, tomography), mechanisms of seismic energy release through earthquakes, differences in events of tectonic or volcanic origin, field surveys and corresponding measurements	Students can explain seismology being part of science examining seismic wave propagation within the body of the Earth near and at the surface, various seismic methods (reflection, refraction, tomography), mechanisms of seismic energy release through earthquakes, differences in			Contextual Learning Discussion Q & A	• Seismic Method • Seismic reflection • Seismic refraction • Seismic tomography • Elasticity and rigidity variations of sub-surface structure near and beneath the surface • Seismic survey and corresponding measurements • Seismic wave propagation • Seismic energy release via tectonic and volcanic earthquakes • Seismo-tectonic activity	

		events of tectonic or volcanic origin, field surveys and corresponding measurements					
5	Being able to understand seismology being part of science examining seismic wave propagation within the body of the Earth near and at the surface, various seismic methods (reflection, refraction, tomography), mechanisms of seismic energy release through earthquakes, differences in events of tectonic or volcanic origin, field surveys and corresponding measurements	Students can explain seismology being part of science examining seismic wave propagation within the body of the Earth near and at the surface, various seismic methods (reflection, refraction, tomography), mechanisms of seismic energy release through earthquakes, differences in events of tectonic or volcanic origin, field surveys and			Contextual Learning Discussion Q & A	• Seismic Method • Seismic reflection • Seismic refraction • Seismic tomography • Elasticity and rigidity variations of sub-surface structure near and beneath the surface • Seismic survey and corresponding measurements • Seismic wave propagation • Seismic energy release via tectonic and volcanic earthquakes • Seismo-tectonic activity	

		corresponding measurements					
6	Being able to understand geodynamo processess in the Earth's outer core as the production of geomagnetic field, rock magnetism and mineral magnetics, secondary magnetic fields, susceptibility variation in rock layers, magnetic anomaly, survey methods and measurements of magnetic anomaly	Students can explain geodynamo processess in the Earth's outer core as the production of geomagnetic field, rock magnetism and mineral magnetics, secondary magnetic fields, susceptibility variation in rock layers, magnetic anomaly, survey methods and measurements of magnetic anomaly			Contextual Learning Discussion Q & A	• Magnetic Method • The Earth as a giant magnetic source • Geodynamo processes • The main field • Secondary sources of magnetic field • Susceptibility variation • Magnetic stratification in the crustal rocks • Magnetic survey • Magnetic anomaly • Magnetic anomaly measurements	
7	Being able to understand electricity in the Earth's crust, natural dan artificial sources of geoelectric method, resistivity and conductivity as two electric parameters, Wenner configuration, Schlumberger configuration, Wenner-Schlumberger configuration	Students can explain electricity in the Earth' crust, natural dan artificial sources of geoelectric method, resistivity and conductivity as			Contextual Learning Discussion Q & A	• Geoelectric Method • Electricity of the Earth • Resistivity and conductivity variations in a layered sub-surface structure beneath the	

		two electric parameters, Wenner configuration, Schlumberger configuration, Wenner-Schlumberger configuration				surface • Geoelectric survey • Resistivity anomaly • Conductivity anomaly • Anomaly measurements in geoelectric survey	
8	**Mid Semester Exam**						**30%**
9	Being able to understand differences in geophysical measurement techniques between natural and artificial sources, a combined method of magnetic and electric approaches or in the form of electromagnetic induction, VLF dan GPR methods for identification of physical structures near the surface	Students can explain differences in geophysical measurement techniques between natural and artificial sources, a combined method of magnetic and electric approaches or in the form of electromagnetic induction, VLF dan GPR methods for identification of physical structures near the surface			Contextual Learning Discussion Q & A	• Electromagnetic Method • Measurement techniques based on electromagnetic wave propagation into the ground with natural and artificial sources • Electromagnetic induction • VLF and GPR methods for identification of sub-surface structure near the surface	
10	Being able to understand	Students can	Student assignment		Contextual Learning	• Electromagnetic	**30%**

	varying surveys and measurement techniques in applied geophysics for exploration of natural resources or other sources that are relevant	explain varying surveys and measurement techniques in applied geophysics for exploration of natural resources or other sources that are relevant	1 (ppt file): handed in		Discussion Q & A	Method • Measurement techniques based on electromagnetic wave propagation into the ground with natural and artificial sources • Electromagnetic induction • VLF and GPR methods for identification of sub-surface structure near the surface	
11	Being able to understand varying surveys and measurement techniques in applied geophysics for exploration of natural resources or other sources that are relevant	Students can explain varying surveys and measurement techniques in applied geophysics for exploration of natural resources or other sources that are relevant			Contextual Learning Discussion Q & A	• Geophysical methods in practice • Errors in measurements • Correction factors • Data collection • Data acquisition • Data processing • Data analysis	
12	Being able to understand varying surveys and measurement techniques in applied geophysics for exploration of natural	Students can explain varying surveys and measurement techniques in			Contextual Learning Discussion Q & A	• Geophysical methods in practice • Errors in measurements • Correction factors	

	resources or other sources that are relevant	applied geophysics for exploration of natural resources or other sources that are relevant				• Data collection • Data acquisition • Data processing • Data analysis	
13	Being able to create a poster relevant to lecture materials in Geophysical Methods	Students can create a poster relevant to lecture materials in Geophysical Methods			Preparation for Presentation for Project-Based Learning Discussion Q & A	Demo ppt files on Geophysical Methods (with lecturers take the lead for the class demo)	
14	Being able to create a poster relevant to lecture materials in Geophysical Methods	Students can create a poster relevant to lecture materials in Geophysical Methods	Student assignment 2 (relevant clips): handed in Criteria for assessment are available		Individual Presentation for Project-Based Learning Discussion Q & A	Individual Presentation on one of Geophysical Methods (with students being active for class presentation)	
15	Being able to create a poster relevant to lecture materials in Geophysical Methods	Students can create a poster relevant to lecture materials in Geophysical Methods	Student assignment 2 (relevant clips): handed in Criteria for assessment are available		Individual Presentation for Project-Based Learning Discussion Q & A	Individual Presentation on one of Geophysical Methods (with students being active for class presentation)	
16	**Final Exam**						**40%**

A.4 MAPPING OF LEARNING OUTCOME-COURSE OUTCOME

A.4.1 Program Learning Outcome (PLO) of UPP

Competency of SSC-ASIIN	Component	Code	Programme Learning Outcome (PLO)
Specific competences	**Knowledge**	KNO-1 (PLO1)	Able to **demonstrate** knowledge of Classical Physics and Modern Physics
		KNO-2 (PLO2)	Able to **formulate** a physical systems as physical model by using mathematics
		KNO-3 (PLO3)	Able to **solve problems** in physical systems comprehensively by using mathematics and computational tools
	Skill	SKI-1 (PLO4)	Able to **analyze** a physical system by applying mathematics and computational tools/ICT
		SKI-2 (PLO5)	Able to **design and conduct** experiments in learning physics by applying the scientific methods
		SKI-3 (PLO6)	Able to **improve their knowledge** and be able to continue their study in a higher education
		SKI-4 (PLO7)	Able to **communicate** their ideas and/or research results in academic writing and speaking effectively
Social and attitude competences	**Social**	SOC-1 (PLO8)	Able to **make a decision** based on the data and information in order to fulfil and evaluate their task responsibility
		SOC-2 (PLO9)	Able to **work as an individual as well as a team** effectively, **have entrepreneurship skill** and awareness of environmental issues
	Attitude	ATT-1 (PLO10)	Able to **demonstrate good scientist's manners**, critical thinking and innovation skills in research and professional fields; and willing to do lifelong learning
		ATT-2 (PLO11)	Able to **demonstrate the appreciation** of **religious values, and nationalism as citizens** as well as conducting their tasks professionally

A.4.2 Program Educational Objective (PEO) of UPP

1. Produce Bachelor of Physics who are able to use physics knowledge and methodology to solve problems in their work field.
2. Produce Bachelor of Physics who have a strong commitment to developing knowledge, whether by studying in a higher-level degree working in a formal institution and entrepreneurs.
3. Produce Bachelor of Physics who master the scientific method to observe, analyze and understand physical phenomena, and produce scientific work and contribute according to their expertise.
4. Produce Bachelor of Physics who masteries physics that is able to apply their knowledge, expertise in various fields of work, and develop themselves in their career environment.
5. Produce Bachelor of Physics who can communicate orally and/ in writing effectively, creatively, innovatively, and collaboratively, as well as working in teams.

A.4.3 Mapping of PLO-PEO

Outcomes	**Objectives**				
	Produce Bachelor of Physics who are able to use physics knowledge and methodology to solve problems in their work field.	Produce Bachelor of Physics who have a strong commitment to developing knowledge, whether by studying in a higher-level degree working in a formal institution and entrepreneurs.	Produce Bachelor of Physics who master the scientific method to observe, analyze and understand physical phenomena, and produce scientific work and contribute according to their expertise.	Produce Bachelor of Physics who masteries physics that is able to apply their knowledge, expertise in various fields of work, and develop themselves in their career environment.	Produce Bachelor of Physics who can communicate orally and/ in writing effectively, creatively, innovatively, and collaboratively, as well as working in teams.
PLO-1	S	S	S	S	S
PLO-2	S	S	S	S	S
PLO-3	S	S	S	S	S
PLO-4	S	S	S	S	S
PLO-5	S	M	S	M	S
PLO-6	S	M	S	S	M
PLO-7	S	S	S	M	S
PLO-8	S	M	S	M	S
PLO-9	S	M	S	M	S
PLO-10	M	M	M	M	S
PLO-11	M	M	M	S	S

Notes:

S = Strong, M = Moderate, L = Low

B. COURSE ASSESSMENT

B.1 ASSESSMENT RUBRIC

Notice that evaluation of student performances is taken from two student assignments, including a thematic ppt file (assignment 1) and an individual presentation (assignment 2), mid and final exams.

The following rubric is used for assessing student assignment 2.

Course : Name of Student :
Course Unit : Study Group :

No	Aspects of Assessment	Scoring Scale			
		1	2	3	4
1	Attitude				
2	Continuity				
3	Content				
4	Time Management				
5	Responsive Talk				
Presentation Grade					

Scoring Scale:

1 = inadequate 3 = good
2 = adequate 4 = very good

Presentation Grade = Total score obtained for each student × 5

B.2 ASSESSMENT SYSTEM

Final grade for each student is obtained from each component of assessment below,
Assignment 1 (ppt file) : 30%
Mid Exam (written) : 30%
Final Exam (written) + Assignment 2 (individual presentation) : 40%

B.3 WEIGHT DISTRIBUTION OF ASSESSMENT

Component	CLO-1	CLO-2	CLO-3	CLO-4	TOTAL
Assignment 1	40	30	-	30	100
Mid Exam	30	30	10	30	100
Final Exam + Assignment 2	25	30	15	30	100

Notice that all numerical data in the above table are given in per cent.

B.4 STUDENT GRADE SYSTEM

Final grade for each student is classified below according to a total score obtained,
Excellent : if a total score is greater than or equal to 80
Good : if a total score is greater than or equal to 70
Satisfactory : if a total score is greater than or equal to 55
Failed : if a total score is less than 55

Grade	Interval
A	85 ≤ A < 100
A-	80 ≤ A- < 85
B+	75 ≤ B+ < 80
B	70 ≤ B < 75
B-	65 ≤ B- < 70
C+	60 ≤ C+ < 65
C	55 ≤ C < 60
D	40 ≤ D < 55
E	0 ≤ E < 40

C. COURSE DEVELOPMENT

C.1 A BRIEF REPORT FOR CLASS RESULTS

The following table reports student academic achievement during the course.

Parameter	N	N in per cent
The number of students taking the subject	15	100
The number of students who has passed the course during a normal time	15	100
The number of students who has passed the course by a remedial treatment	-	-
The number of students who has failed the course after taking a remedial treatment	-	-

C.2 ANALYSIS OF CLASS PROBLEMS

Class achievement is recorded very successful with all the student scored greater than 80, classified as excellent. The final scores were only distributed to grades A and A- (both are classified as excellent academic achievement).

C.3 STRATEGY FOR ALTERNATIF SOLUTIONS

N/A. Perhaps in the future, student assignments may include a short article (for assignment 1), a thematic poster (for assignment 2), and an individual presentation (for assignment 3). All these assignments are evaluated and assessed using different rubrics.

D. APPENDICES

D.1 DOCUMENTS OF CLASS ACTIVITIES

D.1.1 Weekly Journal

KEMENTERIAN RISET, TEKNOLOGI, DAN PENDIDIKAN TINGGI
UNIVERSITAS NEGERI SURABAYA

Kampus Ketintang
Jalan Ketintang, Surabaya 60231
T: +6231-8293484
F: +6231-8293484
laman: unesa.ac.id
email : bakpk@unesa.ac.id

Aktivitas Perkuliahan

Nama Matakuliah : Metode Pengukuran Geofisika **Dosen** : TJIPTO PRASTOWO (196702031995021001)
Kelas : 2016D
Jadwal & Ruang : C03.01.02 (13.00 - 14.40) R.

No.	Tanggal	Pertemuan	Topik	Peserta	Status	Dosen
1	03-02-2020	Pertemuan ke 1	• Penjelasan RPS Metode Pengukuran Geofisika • Penjelasan tugas, sistem evaluasi dan asesmen perkuliahan Metode Pengukuran Geofisika • Pengertian geofisika • Besaran, skala gerak dan skala waktu geofisika • Metode Pengukuran Geofisika	13	Terjadwal	Tjipto Prastowo
2	10-02-2020	Pertemuan ke 2	• Metode gravitasi • Gravitasi lapisan batuan dan mineral Bumi • Variasi densitas sebagai ukuran stratifikasi • Anomali gravitasi • Pengukuran anomali lokal gravitasi	15	Terjadwal	Tjipto Prastowo
3	17-02-2020	Pertemuan ke 3	• Metode seismik • Variasi elastisitas batuan • Seismik refleksi • Seismik refraksi • Seismik tomografi • Body and surface waves • Aktivitas seismik dan energi seismik • Gempa tektonik dan gempa vulkanik • Survei dan pengukuran	15	Terjadwal	Tjipto Prastowo

			seismik			
4	**24-02-2020**	Pertemuan ke 4	• Metode seismik • Variasi elastisitas batuan • Seismik refleksi • Seismik refraksi • Seismik tomografi • Body and surface waves • Aktivitas seismik dan energi seismik • Gempa tektonik dan gempa vulkanik • Survei dan pengukuran seismik	15	Terjadwal	Tjipto Prastowo
5	**02-03-2020**	Pertemuan ke 5	• Metode seismik • Variasi elastisitas batuan • Seismik refleksi • Seismik refraksi • Seismik tomografi • Body and surface waves • Aktivitas seismik dan energi seismik • Gempa tektonik dan gempa vulkanik • Survei dan pengukuran seismik	15	Terjadwal	Tjipto Prastowo
6	**09-03-2020**	Pertemuan ke 6	• Metode magnetik • Kemagnetan Bumi • Medan magnet utama • Proses geodinamo • Kemagnetan lapisan batuan dan mineral Bumi • Variasi suseptibilitas lapisan batuan • Medan magnet eksternal • Anomali lokal magnetik • Survei dan pengukuran anomali magnetik	15	Terjadwal	Tjipto Prastowo
7	**16-03-2020**	Pertemuan ke 7	Kuliah tatap muka ditiadakan menyusul SE Rektor Unesa tentang Upaya Pencegahan Penyebaran Virus Corona (tugas mandiri didistribusikan via WA)	15	Terjadwal	Tjipto Prastowo
8	**23-03-2020**	Pertemuan	UTS online (soal	15	Terjadwal	Tjipto Prastowo

		ke 8	didistribusikan via WA)			
9	**30-03-2020**	Pertemuan ke 9	Pembahasan UTS online	15	Terjadwal	Tjipto Prastowo
10	**06-04-2020**	Pertemuan ke 10	Kuliah online dengan materi persiapan pembuatan file presentasi Metode Pengukuran Geofisika melalui komunikasi terbimbing via WA	15	Terjadwal	Tjipto Prastowo
11	**13-04-2020**	Pertemuan ke 11	Supervisi online Tugas Mandiri perkuliahan online dan tanya jawab via WA untuk persiapan presentasi online	15	Terjadwal	Tjipto Prastowo
12	**20-04-2020**	Pertemuan ke 12	Supervisi online Tugas Mandiri perkuliahan online dan tanya jawab via WA untuk persiapan presentasi online	15	Terjadwal	Tjipto Prastowo
13	**27-04-2020**	Pertemuan ke 13	Supervisi online Tugas Mandiri perkuliahan online dan tanya jawab via WA untuk persiapan presentasi online	15	Terjadwal	Tjipto Prastowo
14	**04-05-2020**	Pertemuan ke 14	Supervisi online persiapan akhir presentasi materi MPG berbasis file ppt yang relevan melalui rekaman video klip	15	Terjadwal	Tjipto Prastowo
15	**11-05-2020**	Pertemuan ke 15	Review perkuliahan MPG melalui pembahasan masing-masing presentasi individual	15	Terjadwal	Tjipto Prastowo

D.1.2 Student Attendance

KEMENTERIAN PENDIDIKAN DAN KEBUDAYAAN
UNIVERSITAS NEGERI SURABAYA

Jl. Lidah Wetan, Surabaya - 60213
Telepon :+6231-99424932
Faksimile :+6231-99424932
e-mail :bakpk@unesa.ac.id

PRESENSI KULIAH
Periode 2019/2020 Genap

Mata Kuliah : **Metode Pengukuran Geofisika** **Dosen** : Prof. Tjipto Prastowo, Ph.D.
Kelas : 2016D
Prodi : S1 Fisika

No	NIM	Nama Mahasiswa	Pertemuan Ke															%
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
			03 Feb 20	10 Feb 20	17 Feb 20	24 Feb 20	02 Mar 20	09 Mar 20	16 Mar 20	23 Mar 20	30 Mar 20	06 Apr 20	13 Apr 20	20 Apr 20	27 Apr 20	04 May 20	11 May 20	
1.	16030224009	AQBEL QASHMAL BILHAQ	A	H	H	H	H	H	H	H	H	H	H	H	H	H	H	93.3 %
2.	16030224033	NEGA BARLIH AMRIH LAKSONO	A	H	H	H	H	H	H	H	H	H	H	H	H	H	H	93.3 %
3.	17030224004	FAHIRA NADIVA ERNANDI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
4.	17030224006	TETI APRILIANI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
5.	17030224009	WIDYA RAHMAWATI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
6.	17030224010	GANDHIS PUTRI AYUDIA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
7.	17030224012	HILDA RISANTI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
8.	17030224013	MOCH. ROMADLON ABDULLOH AKBAR	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
9.	17030224022	FIRDA RULIFIANGGA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
10.	17030224025	IVO NURKHOLIFAH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
11.	17030224031	KHARISMA FITROTUL UMMAH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
12.	17030224037	ERLIN ANDAYANI DEWI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
13.	18030224057	ROIFATU DIANA ZAIN	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
14.	18030224067	MUSLIMATUL FITRIA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
15.	18030224068	QONITAH SALSABILLAH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
Tanda Tangan Dosen / Asisten																		

D.2 DOCUMENTS OF EXAMS

D.2.1 Mid Exam

KEMENTERIAN RISET, TEKNOLOGI DAN PENDIDIKAN TINGGI
UNIVERSITAS NEGERI SURABAYA
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
JURUSAN FISIKA

Kampus Ketintang
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E: physics@unesa.ac.id
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UJIAN TENGAH SEMESTER (UTS)
SEMESTER GENAP TAHUN AKADEMIK 2019/2020

MATA KULIAH / SKS	:	**Metode Pengukuran Geofisika / 2 SKS**
PRODI / KELAS	:	**Fisika / 2016D**
DOSEN	:	**Tjipto Prastowo, Ph.D**
HARI / TANGGAL	:	**Senin, 23 Maret 2020**
MEKANISME	:	**Work in a group at home**
SIFAT	:	**Edisi Covid-19**

PETUNJUK: Kerjakan UTS Metode Pengukuran Geofisika berikut ini dengan baik dalam bentuk kerja sama atau collaborative work within your own working group of 3 students.

Diskripsikan dengan baik dan jelas salah satu metode pengukuran dalam survei geofisika dengan mengambil studi kasus terapan metode tersebut pada penyelesaian masalah geofisika di alam (100 poin). Beberapa metode geofisika adalah sbb:

- Metode Gravitasi
- Metode Magnetik
- Metode Seismik Refleksi
- Metode Seismik Refraksi
- Metode Resistivitas
- Metode Elektromagnetik (GPR, VLF)

Tulislah diskripsimu dalam kertas dengan rincian aturan di bawah ini:

NOTES:

1. Jawaban soal UTS dikumpulkan ke 081231537072 atau tjiptoprastowo@unesa.ac.id
2. Jawaban soal UTS ditulis dengan komputer dalam file docx dengan ketentuan sbb:
   - Ukuran kertas : A4
   - Panjang jawaban : 2 halaman
   - Batas tulisan : 2,54 cm (atas-bawah, kiri-kanan)
   - Jenis font : Times New Roman
   - Ukuran font : 11 pt
   - Ukuran spasi : multiple 1.15
3. Jangan mengumpulkan file ppt pada tahap ini.

D.2.2 Final Exam

KEMENTERIAN RISET, TEKNOLOGI DAN PENDIDIKAN TINGGI
UNIVERSITAS NEGERI SURABAYA
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
JURUSAN FISIKA

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E: physics@unesa.ac.id
fisika.fmipa.unesa.ac.id

UJIAN AKHIR SEMESTER (UAS)
SEMESTER GENAP TAHUN AKADEMIK 2019/2020

MATA KULIAH / SKS	**:**	**Metode Pengukuran Geofisika / 2 SKS**
PRODI / KELAS	**:**	**Fisika / 2016D**
DOSEN	**:**	**Tjipto Prastowo, Ph.D**
HARI / TANGGAL	**:**	**Selasa, 12 Mei 2020**
WAKTU	**:**	**08.00-09.40**

PETUNJUK: Kerjakan UAS Metode Pengukuran Geofisika berikut ini dengan baik dalam bentuk kerja sama atau collaborative work within your own working group of 3 students.

1. Diskripsikan dengan baik mengapa metode geofisika memerlukan survei lapangan. (20 poin)
2. Dalam pelaksanaan survei lapangan, ada metode aktif dan metode pasif.
   Diskripsikan dengan baik perbedaan antara kedua metode tersebut. (20 poin)
3. Dalam pelaksanaan survei lapangan, surveyor memilih metode aktif atau metode pasif untuk melakukan pengukuran besaran fisis yang relevan dengan metode geofisika yang telah dipilih. Faktor apa saja yang bisa memengaruhi akurasi hasil ukur besaran fisis di lapangan ? (20 poin)
4. Pengukuran besaran fisis di lapangan disebut sebagai pengumpulan data lapangan. Seringkali data lapangan bukan berbentuk data tunggal melainkan kombinasi beberapa data besaran fisis. Gabungan data besaran fisis tersebut biasa dikenal sebagai akuisisi data.
5. Data hasil akuisisi kemudian diproses dalam suatu tahap yang dikenal sebagai pemrosesan atau pengolahan data. Faktor apa saja menurutmu yang bisa memengaruhi akurasi hasil pemrosesan atau pengolahan data ? (20 poin)
6. Hasil pemrosesan atau pengolahan data tersebut biasanya dianalisis untuk diinterpretasikan dalam bentuk tafsiran fisis hasil penelitian. Faktor apa saja menurutmu yang bisa memengaruhi akurasi analisis atau interpretasi hasil pemrosesan atau pengolahan data ? (20 poin)

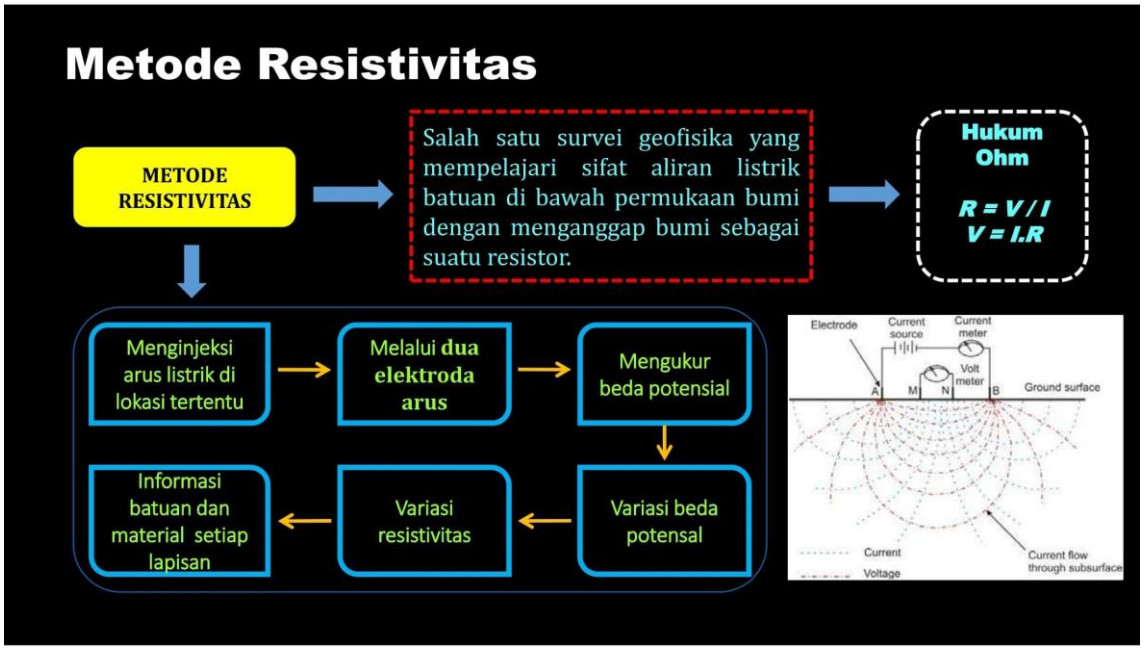
NOTES:

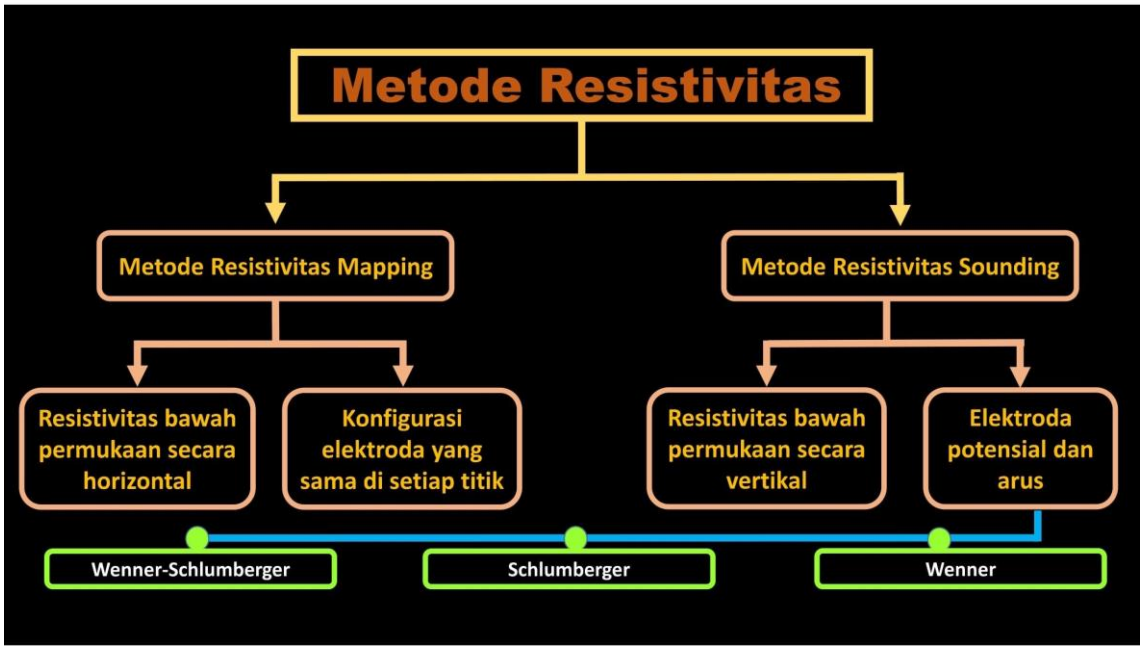
1. Jawaban soal UAS dikirimkan ke tjiptoprastowo@unesa.ac.id
2. Jawaban soal UAS ditulis dengan komputer dalam file docx dengan ketentuan sbb:
   - Ukuran kertas : A4
   - Panjang jawaban : 1 halaman
   - Batas tulisan : 2,54 cm (atas-bawah, kiri-kanan)
   - Jenis font : Times New Roman
   - Ukuran font : 11 pt
   - Ukuran spasi : multiple 1.15
3. Nomer 4 tidak membutuhkan jawaban.

D.3 SAMPLES OF STUDENT PERFORMANCE

D.3.1 Power Point File (Assignment 1)

Students were asked in a group to create a power point file, explaining a geophysical method commonly used in geophysical surveys. Each group had their own topic to discuss in the file. The followings were examples of two slides made by a group of students.





D.3.2 Individual Presentation (Assignment 2)

In this stage, students were required to create a video clip containing a short talk on the basis of their own thematic ppt file for Individual Presentation (Assignment 2). The following picture was taken from a clip made by one of the students, explaining about Resistivity Method.

The following rubric is used for assessing student assignment 2.

Course : Name of Student :
Course Unit : Study Group :

No	Aspects of Assessment	Scoring Scale			
		1	2	3	4
1	Attitude				✓
2	Continuity				✓
3	Content			✓	
4	Time Management			✓	
5	Responsive Talk			✓	
Presentation Grade		**85**			

Scoring Scale:

1 = inadequate
2 = adequate
3 = good
4 = very good

Presentation Grade = Total score obtained for each student × 5

D.3.3 Student Work on Mid Exam

Nama Kelompok:

1. Fahira Nadiva Ernandi (17030224004)
2. Widya Rahmawati (17030224009)
3. Kharisma Fitrotul Ummah (17030224031)

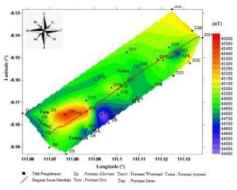
Mempertimbangkan judul topik tulisan kelompok ini, maka akan sangat manis apabila paragraf pembuka dimulai dengan penjelasan singkat tentang apa itu Metode Magnetik.

75

Interpretasi Struktur Bawah Permukaan dan Jalur Sesar Mayor Gerindulu Dengan Metode Magnetik

Penelitian ini telah dilakukan pada kawasan jalur sesar mayor gerindulu, Pacitan. Dengan tujuan untuk mengetahui persebaran nilai anomali medan magnet, struktur bawah permukaan, dan identifikasi jalur sesar tersebut. Sesar Gerindulu merupakan jalur patahan yang searah dengan jalur Sungai Grindulu dan termasuk sesar mayor di Kabupaten Pacitan yang memiliki potensi untuk aktif di masa yang akan datang. Menurut peta, Kawasan Sesar Mayor Grindulu terdiri atas lima formasi batuan yaitu Formasi Alluvium (Qa), Formasi Oyo (Tmo), Formasi Wonosari (Tmwl), Formasi Jaten (Tmj), dan Formasi Arjosari (Toma). Perbedaan formasi ini menyebabkan perbedaan pada struktur bawah permukaan. Penelitian ini menggunakan metode magnetik karena metode ini dapat digunakan untuk mengintrepretasikan dan memodelkan struktur bawah permukaan serta struktur geologi.

Alat yang digunakan untuk akuisisi medan magnet pada kawasan sesar mayor gerindulu adalah Proton Precession Magnetometer (PPM). Medan magnet yang terukur dengan PPM merupakan medan magnet total yang terdiri atas medan magnet utama bumi, medan magnet luar, dan anomali medan magnet. Anomali medan magnet menjadi target metode geomagnet dikarenakan anomali medan magnet merepresentasikan struktur bawah permukaan pada kawasan tersebut.

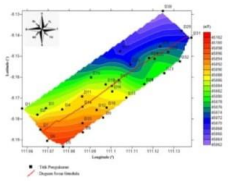


ukuran gambar terlalu kecil

Gambar 1. Kontur Medan Magnet Total

Distribusi nilai medan magnet total dapat diketahui dengan melakukan interpolasi nilai medan magnet total pada titik-titik pengukuran. Skala warna pada kontur di atas menunjukkan adanya klosur rendah, sedang, hingga tinggi. Garis kontur anomali berwarna jingga-merah menunjukkan anomali bernilai positif. Garis kontur anomali berwarna kuning-ungu menunjukkan anomali bernilai negatif. Formasi Qa memiliki nilai medan magnet rendah dikarenakan Formasi Qa ini merupakan hasil endapan sungai dengan material atau batuan yang memiliki nilai suseptibilitas rendah seperti kerakal, kerikil, pasir, lanau, lempung, dan lumpur. Formasi Tmo, Tmwl, dan Toma memiliki nilai medan magnet sedang dikarenakan formasi ini terdiri atas berbagai material penyusun seperti batu pasir, batu lempung, batu gamping yang memiliki nilai suseptibilitas rendah dan batu tuf, batu breksi yang memiliki nilai suseptibilitas tinggi. Formasi Tmj memiliki nilai medan magnet tinggi dikarenakan pada formasi ini terdapat intrusi basalt yang muncul hingga permukaan sepanjang 12,4 m, dimana batuan tersebut memiliki nilai suseptibilitas yang lebih tinggi dibandingkan dengan batuan sedimen yang mendominasi daerah penelitian.

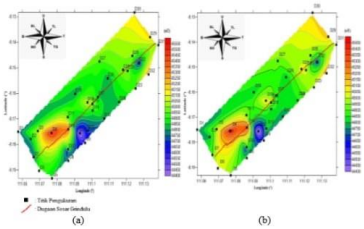
Medan magnet ~~regional~~ global merupakan medan magnet utama bumi yang berubah terhadap waktu. Nilai IGRF (*International Geomagnetic Reference Field*) diperbaharui setiap 5 tahun sekali dimana nilai-nilai tersebut diperoleh dari hasil pengukuran rata-rata pada daerah luasan 1 juta km^2. Kontur IGRF daerah penelitian menunjukkan bahwa bagian selatan memiliki klosur yang lebih tinggi dibandingkan dengan bagian utara daerah penelitian. Rata-rata nilai IGRF di daerah penelitian adalah 45.084 nT.



ukuran gambar terlalu kecil

Gambar 2. Kontur IGRF Daerah Penelitian

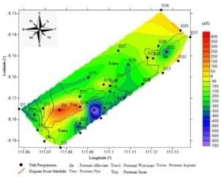
Medan magnet luar merupakan medan magnet yang berasal dari pengaruh luar bumi yang disebabkan oleh adanya arus listrik di ionosfer. Berdasarkan hasil perhitungan, koreksi variasi harian pada kawasan Sesar Mayor Grindulu bervariasi antara -164 nT hingga 83 nT.



ukuran gambar terlalu kecil

Gambar 3. (a) Kontur Medan Magnet Total, (b) Kontur Medan Magnet Total yang dikoreksi Variasi Harian

Setelah dilakukan koreksi variasi harian, peta kontur medan magnet total tidak menunjukkan adanya perubahan yang signifikan. Hal ini menunjukkan medan magnet total yang terukur di lapangan tidak dipengaruhi secara signifikan oleh medan magnet luar.



ukuran gambar terlalu kecil

Gambar 4. Kontur Anomali Medan Magnet di Daerah Penelitian

Anomali medan magnet mencerminkan batuan yang mengandung mineral-mineral bersifat magnetik yang berada di bawah permukaan. Menunjukkan bahwa di daerah penelitian terdapat klosur rendah, sedang hingga tinggi. Nilai anomali medan magnet yang dihasilkan berkorelasi dengan mineral-mineral magnetik penyusun batuan di daerah penelitian, dimana batuan yang tersusun atas banyak mineral-mineral magnetik akan menyumbangkan nilai suseptibilitas yang besar dan sebaliknya. Formasi Qa di daerah penelitian didominasi oleh endapan pasir sungai dan batu pasir yang memiliki rentang nilai suseptibilitas rendah dengan rentang nilai anomali medan magnet -700 nT sampai -400 nT. Pada Formasi Toma, Tmwl, dan Tmo di daerah penelitian terdapat berbagai macam batuan seperti batu gamping, batu pasir, batu lempung, batu breksi dan batu tuf sehingga dihasilkan nilai anomali medan magnet yang lebar dengan rentang nilai -400 nT sampai 50 nT, sedangkan pada Formasi Tmj daerah penelitian terdapat batu pasir konglomeratan dan intrusi basalt yang muncul hingga permukaan dengan rentang nilai anomali medan magnet berkisar antara 50 nT sampai 400 nT.

CATATAN:

1. Tulisan kelompok ini terlalu banyak mengambil kalimat dari sumber utama (kebetulan saya punya file pdf nya).
2. Selain itu, banyak redaksional kalimat yang membingungkan.
3. Sebetulnya tidak masalah apabila kita mengambil ide dari pekerjaan orang dengan catatan kalimat yang kita tulis adalah kalimat buatan kita sendiri. Sekaligus dengan teknik menulis seperti itu kita bisa meringkas dan memperjelas bagian-bagian tertentu dalam teks sumber yang diperlukan untuk mengembangkan cerita sederhana topik tulisammu. Sederhana itu tidak selalu buruk kualitas.

D.3.4 Student Work on Final Exam

In this stage, students were asked to solve a set of problems related to their thematic ppt file describing one of geophysical methods. The students worked in a group to solve the problems.

UAS Metode Pengukuran Fisika

Gandhis Putri Ayudia, Fingda Rulifiangga, Ivo Nurkholifah

1. Metode geofisika adalah metode yang mempelajari parameter-parameter fisika di bawah
20 permukaan bumi yang tidak dapat dilihat oleh mata. Metode geofisika memerlukan survei lapangan untuk mengidentifikasi, menentukan lokasi, sebaran, struktur geologi, serta sampling geologi lapangan untuk menentukan posisi akurat sebelum melakukan pengambilan data utama. Tujuan utama survei geofisika yaitu untuk membuat model bawah permukaan bumi dengan mengandalkan data lapangan yang diukur dengan bantuan alat-alat fisika yang ditempatkan di atas permukaan bumi sehingga diketahui sifat-sifat dan kondisi di bawah permukaan bumi baik secara vertikal maupun horisontal. Survei lapangan maupun pengukuran harus dilakukan secara terus-menerus, berkelanjutan, dan terintegrasi dengan menggunakan beragam metode geofisika.
2. Dalam survei geofisika terdapat dua metode yang dibedakan berdasarkan medan yang digunakan,
20 yaitu metode aktif dan metode pasif. Metode aktif dilakukan dengan membuat sumber usikan untuk mendapatkan respon bumi sebagai gambaran mengenai suatu lokasi tertentu. Sumber usikan berupa arus listrik, sumber radioaktif, atau gelombang elektromagnetik yang diinjeksikan ke dalam bumi dengan respon yang sesuai dengan keadaan strktur yang dilaluinya. Contoh metode aktif yaitu metode geolistrik dan metode seismik. Sedangkan metode pasif adalah metode geofisika yang pengukurannya dilakukan dengan memanfaatkan medan alami yang dipancarkan bumi, misalnya dengan memanfaatkan radiasi gelombang gempa bumi, medan gravitasi bumi, medan magnetik bumi, medan listrik dan elektromagnetik bumi. Contoh metode pasif yaitu metode gravitasi dan metode magnetik.
3. Metode geolistrik resistivitas merupakan metode yang tergolong aktif karena parameter yang
20 diukur yaitu nilai resistivitas batuan yang merupakan respon batuan ketika dikenai medan gangguan berupa arus listrik yang diinjeksikan ke dalam bumi. Faktor-faktor yang mempengaruhi akurasi data hasil ukur besaran fisis di lapangan di antaranya adalah:
    a) batas ketelitian alat ukur yang digunakan
    b) penguasaan terhadap alat ukur yang digunakan
    c) kondisi lingkungan di sekitar lokasi penelitian
    d) penentuan metode yang digunakan
4. –
5. Pemrosesan atau pengolahan data geolistrik resistivitas dari hasil akuisisi dapat dilakukan dengan
19 menggunakan komputer sehingga, memungkinkan untuk penerapan akuisisi data dengan menggunakan software. Adapun faktor-faktor yang mempengaruhi akurasi hasil pemrosesan atau pengolahan data diantaranya adalah:
    a) Jenis software yang digunakan
    b) Ketelitian dalam penginputan data harus sesuai dengan format software yang dipilih
    c) Kelengkapan data yang diperoleh
    d) Pemilahan data atau eliminasi data yang digunakan, hal ini dilakukan untuk menghilangkan data yang memiliki tingkat *error* yang tinggi
6. Pengolahan data geolistrik resistivitas dilakukan dengan menggunakan perangkat lunak dan
16 mendapatkan hasil berupa nilai resistivitas serta posisinya pada suatu kedalaman di bawah permukaan. Faktor yang dapat mempengaruhi akurasi analisis atau interpretasi hasil pemrosesan adalah inversi dan perhitungan nilai resistivitas semu berdasarkan data pengukuran lapangan sehingga interpretasi nilai resistivitas sebenarnya terhadap kedalaman dari data permukaan dan data sekunder juga berpengaruh. Hasil analisis berdasarkan data akan diinterpretasi sebenarnya dan pengelompokan batuan.

D.4 VALIDATION TEST

D.4.1 Validation Test of Mid Exam

KEMENTERIAN PENDIDIKAN, KEBUDAYAAAN,
RISET DAN TEKNOLOGI
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FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
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Surabaya 60231
E: physics@unesa.ac.id

VALIDATION SHEET FOR MID EXAM

Name of Course	:	Geophysical Methods
CLO: 1. Demonstrating independent, creative and honest characters in doing student assignments, mid and final exams. 2. Understanding a systematic study on various methods commonly used in geophysical surveys for examination of sub-surface structures near and beneath the surface including measurements of physical anomalies in a local site. 3. Applying a geophysical method selected to identify characteristics of sub-surface structures near and beneath the surface in a surveyed site accurately. 4. Understanding differences in geophysical data collection and processing techniques between common geophysical methods in the framework of each method completes the other method and vice versa.	:	Sub-CLO: 1. Being able to understand the importance of geophysics, length and time scales in geophyics, geophysical methods and techniques used in field measurements. 2. Being able to understand gravity method, heterogeneity in rock layers and minerals inside the Earth, vertical variation of density, identification of anomaly in gravity for examination of sub-surface structures near and beneath the surface. 3. Being able to understand seismology being part of science examining seismic wave propagation within the body of the Earth near and at the surface, various seismic methods (reflection, refraction, tomography), mechanisms of seismic energy release through earthquakes, differences in events of tectonic or volcanic origin, field surveys and corresponding measurements. 4. Being able to understand geodynamo processess in the Earth's outer core as the production of geomagnetic field, rock magnetism and mineral magnetics, secondary magnetic fields, susceptibility variation in rock layers, magnetic anomaly, survey methods and measurements of magnetic anomaly. 5. Being able to understand electricity in the Earth's crust, natural dan artificial sources of geoelectric method, resistivity and conductivity as two electric parameters, Wenner configuration, Schlumberger configuration, Wenner-Schlumberger configuration. 6. Being able to understand differences in geophysical measurement techniques between natural and artificial sources, a combined method of magnetic and electric approaches or in the form of electromagnetic induction, VLF dan GPR methods for identification of physical structures near the surface. 7. Being able to understand varying surveys and measurement techniques in applied geophysics for exploration of natural resources or other sources that are relevant.

		8. Being able to create a poster relevant to lecture materials in Geophysical Methods.
Lecturer	:	Prof. Tjipto Prastowo, Ph.D
Instruction	:	Give (√) on the column selected: 1. Adequate 2. Good 3. Very Good

No	Aspects	Category		
		1	2	3
1	Instruction for solving the problems			✓
2	Suitability of each question with CLO			✓
3	Level balance of easy, medium and difficult questions		✓	
4	Scoring guidelines follow the points of the mark		✓	
5	The duration of completing the questions follows the time available			✓
6	Allows multiple alternative correct answers	No		
7	Each question does not depend on other questions	Yes		
8	The questions are communicative and do not have ambiguity		✓	
9	Tables, pictures, graphics, maps, or the like are presented clearly and legibly (if any)			

Comments/Suggestions:
Individual presentation are recorded as clips for alternative Final Exam on Geophysical Methods. This is agreement between lecturer and students, which is in line with Semester Lesson Plan (SLP) on Geophysical Methods.

Surabaya, 20 March 2020
Validator,

Prof. Dr. Madlazim, M.Si
NIP 196511051991031012

Response from Lecturer:

Surabaya, 21 March 2020
Lecturer,

Prof. Tjipto Prastowo, Ph.D
NIP 196702031995021001

D.4.2 Validation Test of Final Exam

KEMENTERIAN PENDIDIKAN, KEBUDAYAAAN,
RISET DAN TEKNOLOGI
UNIVERSITAS NEGERI SURABAYA
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
JURUSAN FISIKA

Kampus Ketintang
Jalan Ketintang
Gedung C3, Lantai 1
Surabaya 60231
E: physics@unesa.ac.id

VALIDATION SHEET FOR FINAL EXAM

Name of Course	:	Geophysical Methods
CLO: 1. Demonstrating independent, creative and honest characters in doing student assignments, mid and final exams. 2. Understanding a systematic study on various methods commonly used in geophysical surveys for examination of sub-surface structures near and beneath the surface including measurements of physical anomalies in a local site. 3. Applying a geophysical method selected to identify characteristics of sub-surface structures near and beneath the surface in a surveyed site accurately. 4. Understanding differences in geophysical data collection and processing techniques between common geophysical methods in the framework of each method completes the other method and vice versa.	:	Sub-CLO: 1. Being able to understand the importance of geophysics, length and time scales in geophyics, geophysical methods and techniques used in field measurements. 2. Being able to understand gravity method, heterogeneity in rock layers and minerals inside the Earth, vertical variation of density, identification of anomaly in gravity for examination of sub-surface structures near and beneath the surface. 3. Being able to understand seismology being part of science examining seismic wave propagation within the body of the Earth near and at the surface, various seismic methods (reflection, refraction, tomography), mechanisms of seismic energy release through earthquakes, differences in events of tectonic or volcanic origin, field surveys and corresponding measurements. 4. Being able to understand geodynamo processess in the Earth's outer core as the production of geomagnetic field, rock magnetism and mineral magnetics, secondary magnetic fields, susceptibility variation in rock layers, magnetic anomaly, survey methods and measurements of magnetic anomaly. 5. Being able to understand electricity in the Earth's crust, natural dan artificial sources of geoelectric method, resistivity and conductivity as two electric parameters, Wenner configuration, Schlumberger configuration, Wenner-Schlumberger configuration. 6. Being able to understand differences in geophysical measurement techniques between natural and artificial sources, a combined method of magnetic and electric approaches or in the form of electromagnetic induction, VLF dan GPR methods for identification of physical structures near the surface. 7. Being able to understand varying surveys and measurement techniques in applied geophysics for exploration of natural resources or other sources that are relevant.

Kampus Ketintang
Jalan Ketintang
Gedung C3, Lantai 1
Surabaya 60231
E: physics@unesa.ac.id

		8. Being able to create a poster relevant to lecture materials in Geophysical Methods.
Lecturer	:	Prof. Tjipto Prastowo, Ph.D
Instruction	:	Give (√) on the column selected: 1. Adequate 2. Good 3. Very Good

No	Aspects	Category		
		1	2	3
1	Instruction for solving the problems			✓
2	Suitability of each question with CLO			✓
3	Level balance of easy, medium and difficult questions		✓	
4	Scoring guidelines follow the points of the mark			✓
5	The duration of completing the questions follows the time available			✓
6	Allows multiple alternative correct answers	No		
7	Each question does not depend on other questions	Yes		
8	The questions are communicative and do not have ambiguity		✓	
9	Tables, pictures, graphics, maps, or the like are presented clearly and legibly (if any)			

Comments/Suggestions:
Individual presentation are recorded as video clips for Final Exam as well as written Final Exam on Geophysical Methods. This is agreement between lecturer and students, which is in line with Semester Lesson Plan (SLP) on Geophysical Methods.

Surabaya, 8 May 2020
Validator,

Prof. Dr. Madlazim, M.Si
NIP 196511051991031012

Response from Lecturer:

Surabaya, 9 May 2020
Lecturer,

Prof. Tjipto Prastowo, Ph.D
NIP 196702031995021001

D.5 CLASS ACADEMIC ACHIEVEMENT

PROGRAM STUDI S1 Fisika
DAFTAR NILAI MAHASISWA
Mata Kuliah : Metode Pengukuran Geofisika
Kelas : 2016D
Tahun Ajaran : 2019/2020 Genap

Original data :

Keterangan :
1. Komponen nilai yang diisi hanya : Part,Tugas,UTS dan UAS
2. Nilai UAS mahasiswa dengan kehadiran dibawah 73.3% (kolom dg warna merah) tidak akan disimpan
3. Jangan merubah apapun di dokumen ini kecuali pada point nomer satu di atas.
4. PPTI / BAAK tidak menerima file nilai untuk diupload. Proses upload nilai dilakukan oleh dosen pengampu yang bersangkutan.

No	NIM	Nama Mahasiswa	Angkatan	Kehadiran	Part	Tugas	UTS	UAS	NA	Huruf	Pakai
1	16030224009	AQBEL QASHMAL BILHAQ	2016	93.33%	90	80	78	84	82,8	A-	1
2	16030224033	NEGA BARLIH AMRIH LAKSONO	2016	93.33%	90	80	78	86,5	83,55	A-	1
3	17030224004	FAHIRA NADIVA ERNANDI	2017	100%	90	80	75	84	82,2	A-	1
4	17030224006	TETI APRILIANI	2017	100%	90	85	76	85	84,2	A-	1
5	17030224009	WIDYA RAHMAWATI	2017	100%	90	80	75	81,5	81,45	A-	1
6	17030224010	GANDHIS PUTRI AYUDIA	2017	100%	90	90	85	90	89	A	1
7	17030224012	HILDA RISANTI	2017	100%	90	85	76	90	85,7	A	1
8	17030224013	MOCH. ROMADLON ABDULLOH AKBAR	2017	100%	90	80	78	89	84,3	A-	1
9	17030224022	FIRDA RULIFIANGGA	2017	100%	90	90	85	87,5	88,25	A	1
10	17030224025	IVO NUR KHOLIFAH	2017	100%	90	90	85	87,5	88,25	A	1
11	17030224031	KHARISMA FITROTUL UMMAH	2017	100%	90	80	75	81,5	81,45	A-	1
12	17030224037	ERLIN ANDAYANI DEWI	2017	100%	90	85	76	88	85,1	A	1
13	18030224057	ROIFATU DIANA ZAIN	2018	100%	90	88	85	81	85,7	A	1
14	18030224067	MUSLIMATUL FITRIA	2018	100%	90	88	85	80	85,4	A	1
15	18030224068	QONITAH SALSABILLAH	2018	100%	90	88	85	82	86	A	1