

# Module Handbook

# Master Programme in Geophysical Engineering

FACULTY OF MINING AND PETROLEUM ENGINEERING INSTITUT TEKNOLOGI BANDUNG 2022

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## **Module Handbook Lists**

# Master Program of Geophysical Engineering

No	Code	Module Name	Credit
1	TG5111	Advanced Mathematics in Geophysics	2
2	TG5112	Advanced Wave and Field in Geophysics	3
3	TG5114	Advanced Signal Geophysical Analysis	2
4	TG5024	Research Methodology	3
5	TG6232	Fieldwork	2
6	TG5031	Earthquake Seismology	3
7	TG6031	Geodynamics and Seismotectonics	3
8	TG6032	Geohazard and Volcano Physics	3
9	TG5032	Computational Seismology	3
10	TG5122	Acquisition and Processing of Seismic Data	2
11	GL5025	Petroleum System	2
12	TG5225	Advanced Rock Physics	2
13	TG5131 (TG5034)	Advanced Seismic Interpretation	3
14	TG6041	Reservoir Geophysics	3
15	TG5161	Advanced Gravity and Magnetic Method	3
16	TG5162	Advanced Geoelectrical Method	2
17	TG5042	Mining Geophysics	2
18	TG5043	Geothermal Exploration	2
19	TG6044	Advanced Engineering and Environmental Geophysics	2
20	TG5023	Advanced Geophysical Inversion Method	2
21	TG5025	Geoscience Summer School	2
22	TG5033	Geomechanics in Geophysics	2
23	TG5113	Exploration and Engineering Seismology	2
24	TG5133	Hidrogeophysics	2
25	TG5134	Geophysical Modeling and Tomography	2
26	TG5025	Individual Project in Geophysics	2
27	TG5149	Microseismic	2
28	TG5213	Advanced Geostatistics	2
29	TG5232	Disaster Mitigation	2
30	TG5235	Exploration Geophysics for Oil and Gas	2
31	TG6142	Marine Geophysics	2
32	TG6142	Capita of Selecta in Geophysics	2
33	TG6243	Advanced Engineering Seismology	2
34	TG6244	Surface Wave Exploration	2
35	TG5011	Applied GeoEM in Earth Sciences and Technology	2
36	TG6091	Thesis 1	4
37	TG6092	Thesis 2	4
38	TG5264	Advanced Electromagnetic Method	2

## Master Program of Geophysical Engineering

# **1.** Advanced Mathematics in Geophysics

Module designation	Advanced Mathematics in Geophysics	
Module level	Master	
Code, if applicable	TG5111	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	First Semester / first Year	
module is taught		
Module coordinator(s)	Prof.Dr. Wawan Gunawan A. Kadir, MS	
Lecturer(s)	Prof.Dr. Wawan Gunawan A. Kadir, MS	
Language	Bahasa Indonesia	
Relation to curriculum	Major Subject / Compulsory Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	$\checkmark$
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class	
	using slide in LCD projector, followed by discussion	$\checkmark$
	session. After presentation, they make report what	
	they present before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	,
	class students explain how to solve the problem in	$\checkmark$
	groups. Lecturer checks how they solve the problem in	
	turns.	
	Class project and discussion	1
	Lecturer gives students a project which related to	$\checkmark$
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	$\checkmark$
	consults problem which they face and discuss together	
	how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	-
	assistant tell main idea of practical or experimental.	
	i ney do the practical afterwards.	
	Field trip	
	visit field area or company which is related to course	-
	material.	

	1		
Workload	Class le	ectures	2 hours
	Tutoria	al session	1 hour
	Superv	vision and consultation	1 hour
	Practic	al or experimental laboratory work	
	Individ	ual studies	6 hours
	Total w	orkload per week	10 hours
	Present	ration	2 hours
	Class nr		38 hours
	Field tri	in	-
	Total w	orkload per semester	160 hours
Credit points	2		
Requirements prerequisites			
Learning Goals			
Knowledge		Skill Compete	nce
Understand basic conce	ept of the	Able to apply     Take possess	sion of
Mathematic equations	that	expanding Powers capability fo	r problem
equations that will be a	pplied	series real harmonic solving in ge	ophysical
on geophysical method	s.	and complex method usin	ıg
Understand power serie	es and its	harmonic on expanding fu	unction of
expanding in some mat	hematic	geophysical problem. power series	s real and
equations that can be a	pplied	<ul> <li>Understand to apply complex har</li> </ul>	monic
on geophysical method	s.	Euler's equation on oscillation.	
Understand the concep	ot of	Fourier and Laplace • Capable in a	pplication
complex number and its		transformation. of Delta and	step
solution in rectangular	and	Familiar in application functions for	r defining
polar coordinate system	ns.	of Delta and step subsurface (	interior of
Understand basic conce	ept of	functions for defining the earth) or	n
some special functions	and its	subsurface (interior of geophysical	data, and
background used on		the earth) on its response	on
geophysical methods.		geophysical data, and geophysical	data.
Understand expanding	power	its response on • Capability in	
series and complex nun	nber on	geophysical data. application of	of Fourier
Fourier and Laplace tra	nsform	Able to apply Fourier and Laplace	
Understand basic conce	ept of	and Laplace transforms,	
convolution and its		transforms, and convolution	on
relationship with Fourie	er-	convolution on geophysical	data
Laplace transforms.		geophysical data. analysis.	
Content	Introduc	tion, infinite Series, definition of Power Se	eries and its
	Complex	Number ergand diagram complex num	definition of
	Complex	Number, argano diagram, complex numi	ber in polar
	Compley	Number in Geophysical methods. Faurier	series and
	Eourior	series Fourier integral Fourier transform	convolution
	annlicati	on in geophysics Lanlace Transform genera	lized Fourier
	transform	n lanlace transform of delta function con	volution and
1			volution unu

and polar coordinate system

laplace transform, strain in a inelastic solid, seismometer, Wave Equation, vibration of string, Helmholtz eq., solution in cylindrical

Study and examination requirements and forms of examination	Midterm test Final Test Presentation, quizzes, homework	√ √ √	equal		
	Laboratory work	-			
Media employed	Slides, beamer, boards communication, internet, exe	, appropriat ercises etc.	te software,	online	
Reading list	<ol> <li>Boas, M.J., Mathematical method in the physical sciences, 2nd ed., John Wiley &amp; Sons, 1983.</li> <li>Farlow, S.J., Partial Differential Equations for Scientists &amp; Engineers, John Wiley &amp; Sons, 1982</li> <li>Rikitake, Sato, Hagiwara, Applied Mathematic for Earth Scientist, Terra Scientist Publishing Comp., 1987</li> </ol>				

# 2. Advanced Wave and Field in Geophysics

Module designation	Advanced Wave and Field in Geophysics	
Module level	Master	
Code, if applicable	TG5112	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	First Semester / first Year	
module is taught		
Module coordinator(s)		
Lecturer(s)	Dr. Darharta Dahrin, MS, Dr.Eng.Ir. T.A. Sanny, M.Sc.	
Language	Bahasa Indonesia	
Relation to curriculum	Major Subject / Compulsory Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class	
	using slide in LCD projector, followed by discussion	$\checkmark$
	session. After presentation, they make report what	
	they present before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	$\checkmark$
	groups. Lecturer checks how they solve the problem in	
	turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	$\checkmark$
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	
	consults problem which they face and discuss together	-
	how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	-
	assistant tell main idea of practical or experimental.	
	They do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to course	-
	material.	

Workload				
	Class lectures	3 hours		
	Tutorial session	3 hour		
	Supervision and consultation	-		
	Practical or experimental laboratory work	-		
	Individual studies	9 hours		
	Total workload per week	15 hours		
	Presentation	2hours		
	Class project	13 hours		
	Field trip	-		
	Total workload per semester	240 hours		
Credit points	3			
Requirements prerequisites				
Learning Goals				
		1		
Knowledge	Skill Compete	nce		
The students are able	to • The students are able • Possess the o	apability to		
explain the wave a	nd resolve the wave and apply the wa	ve and field		
Field in geophysics a	nd field parameters in theories in	seismology		
how to formulate t	he mathematics, and then and all	potential		
wave and field in vario	us they are able to use methods in g	eophysics.		
cases in geophysics.	these formulas in			
	geophysics.			
Content	The topics on the subject are focused into the follow	ving subtopics:		
	fundamental concept of wave on geophysics, G	een function,		
	Fourier Series, Fourier integral, discrete spectral analysis, Vibration,			
	Acoustic wave, Elastic waves; Compressional wave,	shear waves,		
	derivative of the elastic wave equation, bound	ary condition,		
	reflection and transmission coefficient, Reflection	isotropic and		
	convolution, Fluid-solid boundary, Material symmetry			
	equation Christoffel equation Euler equation Ferma	t principle and		
	Ray parameter Field equation, potential loop and mi	itual induction		
	nay parameter. Field equation, potential, loop and mutual induction			
	transient induced polarization theorem electric induction models			
	electric polarization POTENTIAL FIELD: Solution of	potential field		
	equation. Laplace, Poisson, and diffusion equat	ion. GRAVITY		
	POTENTIAL: gravity potential field analysis. gravity field of the earth.			
	MAGNETIC POTENTIAL: magnetic dipole field, magnetic	tic field of the		
	earth, magnetic anomalies			

Study and examination	[	1	r1		
requirements and forms of	Midterm test		35%		
examination	Final Test	$\checkmark$	35%		
examination	Presentation, quizzes,	2	20%		
	homework	v	5078		
	Laboratory work	-	-		
Media employed	Slides, beamer, boards	, appropriat	e software, on	line	
	communication, internet, exe	ercises etc.			
Reading list	1. Aki, K. & Richard, R., Adv	vance Theory o	f Seismology,2002		
	2. Berkhout, A. J., Applied	Seismic Wave <sup>-</sup>	Theory, Elsevier, 198	7	
	3. Blakely, R.L., 1996, Pote	ential Theory i	n Gravity and Magn	etic	
	Applications.				
	4. Boas, M.L., 2006, Ma	thematical Me	ethods in the Phys	sical	
	Sciences, 3rd. Ed. John V	Viley and Sons			
	5. Bullen, K.E., An Introd	uction to the	Theory of Seismol	ogy,	
	Cambridge University Pr	ess, 1985.			
	6. Griffiths, D.J., 1999, Inti	roduction to E	lectrodynamics, 3rd	ed.,	
	Prentice Hall.				
	7. Lowrie, W., 2011, A stud	dent's Guide to	Geophysical Equation	ons,	
	Cambridge Univ. Press. 8	3. Slawinski, M	.A., 2003, Seismic Wa	aves	
	and Rays in Elastic Medi	ia, Pergamon-E	Elsevier Scinece Limit	ed	
	9. Turcotte, D.L. and	Schubert, G	i., 1982, Geodynar	nics	
	Application of continuur	m Physics to ge	eological Problems. J	ohn	
	Wiley & Sons. 10. Wa	Wiley & Sons 10 Wait 18 1982 Geo-Electromagnetism			
	Academic Press	,,,	non	,	
	Academic Press				

# 3. Advanced Signal Geophysical Analysis

Module designation	Advanced Signal Geophysical Analysis	
Module level	Master	
Code, if applicable	TG5114	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	First Semester / first Year	
module is taught		
Module coordinator(s)	Prof.Dr. Wawan Gunawan A. Kadir, MS	
Lecturer(s)	Prof.Dr. Wawan Gunawan A. Kadir, MS	
Language	Bahasa Indonesia	
Relation to curriculum	Major Subject / Compulsory Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be	
	pop quizzes, task, or homework in some classes.	$\checkmark$
	Lecturer presents course material using media	
	such as slide in LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of	
	class using slide in LCD projector, followed by	
	discussion session. After presentation, they	
	make report what they present before.	
	Tutorial session	
	Lecturer gives students some problem	
	beforehand. In class students explain how to	$\checkmark$
	solve the problem in groups. Lecturer checks	
	how they solve the problem in turns.	
	Class project and discussion	
	Lecturer gives students a project which related	$\checkmark$
	to current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project.	1
	Students consults problem which they face and	N
	discuss together how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the	
	laboratory according to practical module. Firstly,	-
	laboratory assistant tell main idea of practical or	
	experimental. They do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to	-
	course material.	
		·

Workload	Class	lectures		2 hours
	Tuto	rial session		2 hours
Supe		ervision and consultation	2 hours	
Pract		tical or experimental laborato	-	
	Indiv	vidual studies	<u> </u>	4 hours
	Total	workload per week		10 hours
	Prese	entation		2 hours
	Class	project		38 hours
	Field	trip		-
	Total	workload per semester		160 hours
Credit points	2			
Requirements prerequisites				
Learning Goals				
Knowledge		Skill	Competer	nce
Understand basic conce	ept of	• Able to design	Take posses	sion of
Knowledge         • Understand basic concept of analog, continuous, digital, and discrete data.         • Understand relationship between signal, system, and output of the system in geophysical data.         • Understand the principal of digitization and its application on geophysical data acquisition.         • Understand analog and discrete Fourier transform, and its application on some special function.         • Physical meaning of convolution and correlation process, and its theorem on time and frequency domain, and application on geophysical data.         • Understand basic concept of filtering and its process on time and frequency domains, and its application on geophysical data.		<ul> <li>Able to design geophysical data acquisition based on the concept of digitization and sampling theory.</li> <li>Understand to apply the Fourier transform for analyzing geophysical data in spectral domain.</li> <li>Familiar in application of convolution and correlation processes in time and frequency domains for geophysical data.</li> <li>Able to apply filtering process through convolution and correlation process in time and frequency domains, and its application on geophysical data</li> </ul>	<ul> <li>Take posses capability for geophysical acquisition basi concept of digit sampling theory</li> <li>Capable in app the Fourier tra analyzing geoph in spectral doma</li> <li>Has capabili application of cc and correlation in time and domains for ge data.</li> <li>Has capability i process convolution correlation in frequency dom its applicati geophysical processing.</li> </ul>	sion of designing data ed on the ization and olication of nsform for nysical data ain. lity in processes frequency eophysical n filtering through and time and lains, and on on data
Content	Introdu	uction: Signal, noise, and sys	tem in geophysic	s, analog and
	digital geophy Fourier and fre meanin geophy theory in time geophy	signal, digitation; Fourier tr ysical data: Fourier series, r transform; Discrete Fourier r integral, FFT; Convolution in equency, space and wave nu- ng of convolution, design ysical data: definition, cross in geophysics: sampling funct e and freq domain; Phase prop ysical data; Cases of digital sig	ansform and its a Fourier integral, transform: Fourie geophysics: convo umber, convolutio of software; C and auto correlati tion, sampling the perties of digital si gnal application in	application in properties of er coefficient, lution in time in properties, orrelation in ion; Sampling prem, aliasing gnal; Filtering geophysics.

Study and examination					
requirements and forms of	Midterm test	$\checkmark$			
examination	Final Test $$		oqual		
	Presentation, quizzes,		equai		
	homework	N			
	Laboratory work	-			
Media employed	Slides, beamer, boards, appropriate software, online				
	communication, internet, ex	ercises etc.			
Reading list	1. Oram Brigham, B, Th	e Fast Fourier	Transform and its		
	Applications, Prentic	e-Hall Inc., 198	8.		
	2. Robinson, A. B., Geo	physical Signal	Analysis, Prentice-H	all	
	Inc., 1980.				

## 4. Research Methodology

Module level       Master         Code, if applicable       TG5024         Sub-heading, if applicable:	Module designation	Research Methodology	
Code, if applicable       TG5024         Sub-heading, if applicable:       -         Courses included in the module, if applicable:       -         Semester(s) in which       Second Semester / first Year         Module coordinator(s)       Prof. Dr. Satria Bijaksana         Lecturer(s)       Prof. Dr. Satria Bijaksana         Language       Bahasa Indonesia         Relation to curriculum       Major Subject / Compulsory Course         Type of teaching, contact       -         hours       Class lecturers         Lecturer(s)       Presentation         Students present course material using media such as slide in       .         LCD projector and whiteboard.       -         Presentation       Students present course materials in front of class         using slide in LCD projector, followed by discussion visession.       session         Lecturer gives students some problem beforehand. In       .         class students explain how to solve the problem in       vi         groups. Lecturer checks how they solve the problem in       vi         Class project and discussion       .         Lecturer gives students a project which related to       vi         Current issues and course material.       Supervision and consultation         This activity is continuation of cla	Module level	Master	
Sub-heading, if applicable:       -         Courses included in the module, if applicable:       -         module, if applicable:       Second Semester / first Year         module is taught       Prof. Dr. Satria Bijaksana         Lecturer(s)       Prof. Dr. Satria Bijaksana         Language       Bahasa Indonesia         Relation to curriculum       Major Subject / Compulsory Course         Type of teaching, contact hours       Class lectures         Lecturer teaches students in class. There will be pop quizzes, task, or homework in some classes. Lecturer v presents course material using media such as slide in LCD projector and whiteboard.       V         Presentation       Students present course materials in front of class using slide in LCD projector, followed by discussion session. After presentation, they make report what they present before.       V         Tutorial session       Lecturer gives students some problem beforehand. In class students explain how to solve the problem in groups. Lecturer checks how they solve the problem in turns.       V         Class project and discussion       V       V         Lecturer gives students a project which related to current issues and course material.       V         Supervision and consultation       V       V         This activity is continuation of class project. Students consults problem which they face and discuss together how to solve the problem.       V         Practical or	Code, if applicable	TG5024	
Courses included in the module, if applicable: Semester(s) in which Module coordinator(s) Prof. Dr. Satria Bijaksana Language Bahasa Indonesia Relation to curriculum Major Subject / Compulsory Course Type of teaching, contact hours Class lectures Lecturer teaches students in class. There will be pop quizzes, task, or homework in some classes. Lecturer v presents course material using media such as slide in LCD projector and whiteboard. Presentation Students present course materials in front of class using slide in LCD projector, followed by discussion Students present before. Tutorial session Lecturer gives students some problem beforehand. In class students explain how to solve the problem in groups. Lecturer checks how they solve the problem in turns. Class project and discussion Lecturer gives students a project. Which related to current issues and course material. Supervision and consultation This activity is continuation of class project. Students consults problem which they face and discuss together how to solve the problem. Practical or experimental laboratory work Students do ractical or experimental. They do the practical afterwards. Field trip Visit field area or company which is related to course -	Sub-heading, if applicable:	-	
module, if applicable:       Second Semester / first Year         Semester(S) in which       Second Semester / first Year         module is taught       Prof. Dr. Satria Bijaksana         Lecturer(s)       Prof. Dr. Satria Bijaksana         Language       Bahasa Indonesia         Relation to curriculum       Major Subject / Compulsory Course         Type of teaching, contact hours       Class lectures         Lecturer teaches students in class. There will be pop quizzes, task, or homework in some classes. Lecturer       √         presents course material using media such as slide in LCD projector and whiteboard.       Presentation         Students present course materials in front of class       using slide in LCD projector, followed by discussion         Students present before.       Tutorial session       √         Lecturer gives students some problem beforehand. In class students explain how to solve the problem in turns.       √         Class project and discussion       Lecturer gives students a project which related to vi current issues and consultation       √         Supervision and consultation       Itextures issues and consultation       √         Prescination of class project. Students consults problem.       Prescination       √         Prescination of class project which related to vi current issues and consultation       √          Tutorial session       Le	Courses included in the		
Semester(s) in which       Second Semester / first Year         Module coordinator(s)       Prof. Dr. Satria Bijaksana         Lecturer(s)       Prof. Dr. Satria Bijaksana         Language       Bahasa Indonesia         Relation to curriculum       Major Subject / Compulsory Course         Type of teaching, contact       hours         Class lectures       Lecturer teaches students in class. There will be pop quizzes, task, or homework in some classes. Lecturer         Juizzes, task, or homework in some classes. Lecturer       √         Presentation       Students present course materials in front of class         Students present course materials in front of class       using slide in LCD projector, followed by discussion         V       Students present tourse materials in front of class         using slide in LCD projector, followed by discussion       √         Lecturer gives students some problem beforehand. In       class students explain how to solve the problem in         Uprovision and consultation       Lecturer gives students a project which related to       √         Class project and discussion       ↓          Lecturer gives students a project students       √         Class project and discussion       ↓         Lecturer gives students a project. Students       √         Relation       Supervision and consultation <td>module, if applicable:</td> <td></td> <td></td>	module, if applicable:		
module is taught       Prof. Dr. Satria Bijaksana         Lecturer(s)       Prof. Dr. Satria Bijaksana         Language       Bahasa Indonesia         Relation to curriculum       Major Subject / Compulsory Course         Type of teaching, contact       Class lectures         Lecturer teaches students in class. There will be pop quizzes, task, or homework in some classes. Lecturer       √         presents course material using media such as slide in LCD projector and whiteboard.	Semester(s) in which	Second Semester / first Year	
Module coordinator(s)         Prof. Dr. Satria Bijaksana           Lecturer(s)         Prof. Dr. Satria Bijaksana           Language         Bahasa Indonesia           Relation to curriculum         Major Subject / Compulsory Course           Type of teaching, contact             hours         Class lectures           Lecturer teaches students in class. There will be pop quizzes, task, or homework in some classes. Lecturer             Presentation               Students present course material using media such as slide in LCD projector and whiteboard.             Presentation               Students present course materials in front of class using slide in LCD projector, followed by discussion session. After presentation, they make report what they present before.             Tutorial session                 Lecturer gives students aproject which related to current issues and course material.               Supervision and consultation	module is taught		
Lecturer(s)       Prof. Dr. Satria Bijaksana         Language       Bahasa Indonesia         Relation to curriculum       Major Subject / Compulsory Course         Type of teaching, contact       Indonesia         hours       Class lectures         Lecturer teaches students in class. There will be pop quizzes, task, or homework in some classes. Lecturer       √         presents course material using media such as slide in LCD projector and whiteboard.       ✓         Presentation       Students present course materials in front of class using slide in LCD projector, followed by discussion √         session. After presentation, they make report what they present before.       ✓         Tutorial session       ✓         Lecturer gives students some problem beforehand. In class students explain how to solve the problem in groups. Lecturer checks how they solve the problem in turns.       ✓         Class project and discussion       ✓         Lecturer gives students a project. Which related to current issues and course material.       ✓         Supervision and consultation       This activity is continuation of class project. Students consults problem which they face and discuss together how to solve the problem.       ✓         Practical or experimental laboratory according to practical or or experimental.       ✓       ✓         Students do practical of practical or experimental.       ✓       ✓         Stu	Module coordinator(s)	Prof. Dr. Satria Bijaksana	
Language       Bahasa Indonesia         Relation to curriculum       Major Subject / Compulsory Course         Type of teaching, contact <ul> <li>Class lectures</li> <li>Lecturer teaches students in class. There will be pop quizzes, task, or homework in some classes. Lecturer presents course material using media such as slide in LCD projector and whiteboard.</li> <li>Presentation</li> <li>Students present course materials in front of class using slide in LCD projector, followed by discussion session. After presentation, they make report what they present before.</li> <li>Tutorial session</li> <li>Lecturer gives students some problem beforehand. In class students explain how to solve the problem in groups. Lecturer gives students a project which related to current issues and course material.</li> <li>Supervision and consultation</li> <li>This activity is continuation of class project. Students consults problem.</li> <li>Practical or experimental laboratory work</li> <li>Students do practical or experimental. In the laboratory assistant tell main idea of practical or experimental.</li> <li>They do the practical afterwards.</li> <li>Field trip</li> <li>Visit field area or company which is related to course</li> <li>List field area or company which is related to course</li> <li>List field trip</li> <li>Visit field area or company which is related to course</li> <li>List field trip</li> </ul>	Lecturer(s)	Prof. Dr. Satria Bijaksana	
Relation to curriculum       Major Subject / Compulsory Course         Type of teaching, contact       Class lectures         Lecturer teaches students in class. There will be pop       quizzes, task, or homework in some classes. Lecturer         presents course material using media such as slide in       LCD projector and whiteboard.         Presentation       Students present course materials in front of class         using slide in LCD projector, followed by discussion       √         session. After presentation, they make report what       they present before.         Tutorial session       Lecturer gives students some problem beforehand. In         class students explain how to solve the problem in       √         groups. Lecturer checks how they solve the problem in       √         Class project and discussion       √         Lecturer gives students a project which related to       √         current issues and course material.       √         Supervision and consultation       This activity is continuation of class project. Students consults problem which they face and discuss together how to solve the problem.       √         Practical or experimental laboratory work       Students do practical or experimental.       -         Lecturer give students a project. Students consults problem which they face and discuss together how to solve the problem.       -       -         Practical or experimental	Language	Bahasa Indonesia	
Type of teaching, contact       Class lectures         hours       Class lectures         Lecturer teaches students in class. There will be pop       quizzes, task, or homework in some classes. Lecturer         yresents course material using media such as slide in       LCD projector and whiteboard.         Presentation       Students present course materials in front of class         using slide in LCD projector, followed by discussion       √         session. After presentation, they make report what       they present before.         Tutorial session       Lecturer gives students some problem beforehand. In         class students explain how to solve the problem in       √         groups. Lecturer checks how they solve the problem in       √         Class project and discussion       √         Lecturer gives students a project which related to       √         current issues and course material.       √         Supervision and consultation       This activity is continuation of class project. Students         consults problem which they face and discuss together       how to solve the problem.         Practical or experimental laboratory work       Students do practical or experimental.         They do the practical afterwards.       Field trip         Visit field area or company which is related to course       -	Relation to curriculum	Major Subject / Compulsory Course	
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LCD projector and whiteboard.         Presentation         Students present course materials in front of class         using slide in LCD projector, followed by discussion         session. After presentation, they make report what         they present before.         Tutorial session         Lecturer gives students some problem beforehand. In         class students explain how to solve the problem in         groups. Lecturer checks how they solve the problem in         turns.         Class project and discussion         Lecturer gives students a project which related to         current issues and course material.         Supervision and consultation         This activity is continuation of class project. Students         how to solve the problem.         Practical or experimental laboratory work         Students do practical or experimental in the laboratory         according to practical module. Firstly, laboratory         assistant tell main idea of practical or experimental.         They do the practical afterwards.         Field trip         Visit field area or company which is related to course		presents course material using media such as slide in	
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Visit field area or company which is related to course -		Field trip	
		Visit field area or company which is related to course	-
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	Class lectures	-
	Tutorial session	9 hours
	Supervision and consultation	15 hours
	Practical or experimental laboratory work	4 hours
	Individual studies	11 hours
	Total workload per week	-
	Presentation	240 hours
	Class project	-
	Field trip	9 hours
	Total workload per semester	15 hours
Credit points	3	
Requirement's prerequisites		

Knowledge	Skill	Competence
<ul> <li>Understand the importance of literature review in proposing research work</li> <li>Understand the importance in recognizing research gat that could be exploited as research question in his/her research propose</li> <li>Understand the importance of publishir his/her own scholarly work in scientific journa</li> <li>Understand the need to make a sound working proposal that he/she would use to complete his/her research work.</li> <li>Understand the importance of time scheduling and costing research proposal.</li> </ul>	<ul> <li>Able to find the required literatures using database (Google Scholar, SCOPUS), contacting authors and other means.</li> <li>Able to identify research gap in the literature and exploit it for his/her research work.</li> <li>Able to communicate with his/her own research supervisor to write a sound working proposal.</li> </ul>	<ul> <li>Able to write a sound working proposal that not only meet the specific requirement of the School of Graduate Studies but also lead to publication in scientific journal.</li> </ul>
Content	Concept of research methodology and process of research: selection conceptual framework, research h design, research operationalization Implementation of research metho preparation. Scientific and technic technical report and scientific pap	and scientific methods. Elements of topics, problem statement, ypothesis, research method and n and results finding. odology for thesis proposal cal communication: writing er, effective presentation

Study and examination				
requirements and forms of	Draft of proposal		30%	
examination	Final proposal		40%	
	Presentation of proposal		30%	
	Laboratory work			
Media employed	Slides, beamer, boards, app	ropriate softwa	re, online	
	communication, internet, e	xercises etc.		
Reading list	1. Guidelines for Thesis and Dissertation, School of Graduate			ate
	Studies (http://www.sps.itb.ac.id/in/pedoman-tesis-dan			n-
	disertasi)			
	2. ID Satria Bijaksana:	Komunikasi Ge	ofisika - Literatur dal	am
	Geofisika (https://w	/ww.youtube.co	om/watch?v=75vYQ-	-
	yTYag)			
	3. How To Choose A R	esearch Topic F	or A Dissertation or	
	Thesis			
	(https://www.youtu	ube.com/watch	?v=hXvoKE6 wQo)	
	4. How To Write A Lite	erature Review	In 3 Simple Steps	
(https://www.youtube.com/watch?y=lw8HPXIP1)		· ?v=lw8HPXJP1VA)		
	5. Ultimate Guide to v	vrite Perfect Re	search Proposal	
	(https://www.youtu	ube.com/watch	?v=m_yCeVuB1XU)	

## 5. Fieldwork

Module designation	Fieldwork	
Module level	Master	
Code, if applicable	TG6232	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	Second Semester / first Year	
module is taught		
Module coordinator(s)	Dr.Ir. Agus Laesanpura, MS	
Lecturer(s)	Dr.Ir. Agus Laesanpura, MS	
Language	Bahasa Indonesia	
Relation to curriculum	Major Subject / Compulsory Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	guizzes, task, or homework in some classes. Lecturer	
	presents course material using media such as slide in	
	ICD projector and whiteboard	
	Presentation	
	Students present course materials in front of class using	
	students present course materials in none of class using	
	Side in LCD projector, followed by discussion session.	N
	After presentation, they make report what they present	
	before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	
	groups. Lecturer checks how they solve the problem in	
	turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	1
	consults problem which they face and discuss together	
	how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	2
	according to practical module. Firstly, laboratory	N
	They do the grantical of terry and	
	riney do the practical afterwards.	
	Field trip	,
	Visit field area or company which is related to course	$\checkmark$
	material.	

Workload			
	Class lectures	2 hours	
	Tutorial session	1 hours	
	Supervision and consultation	2 hours	
	Practical or experimental laboratory work	1 hours	
	Individual studies	4 hours	
	Total workload per week	10 hours	
	Presentation	5 hours	
	Class project	15 hours	
	Field trip	50 hours	
	Total workload per semester	160 hours	
Credit points	2		
Requirements prerequisites	Advanced Geophysical Mathematics (Taken Simultaneously)		
	Wayes and Terrain in Geophysics (Taken Simultaneously)		

Knowledge	Skill	Competence
<ul> <li>Understand the importance of geological information and geological observation in geophysical works.</li> <li>Understand the principles and methodologies in general geophysical methods (gravity, magnetic, refraction seismology, geoelectricty, GPR (ground penetrating RADAR), EM methods).</li> <li>Understand the importance of combined methods in geophysical exploration.</li> <li>Understand the basic elements in designing geophysical surveys.</li> </ul>	<ul> <li>Having field experience in geological and geophysical survey.</li> <li>Able to conduct basic geological survey that include field observation, data processing and producing basic geological map.</li> <li>Able to design simple geophysical survey by considering the availability of manpower, instruments, logistics, transports etc.</li> <li>Able to operate basic geophysical instruments in the field including simple trouble shooting</li> <li>Able to handle and process data generated by geological and geophysical surveys.</li> <li>Able to make simple interpretation on the results of geophysical surveys.</li> <li>Able to communicate his/her own finding through oral presentation as well as through written report.</li> <li>Able to work in a team in the stressful field environment.</li> </ul>	<ul> <li>Confidence in leading a simple geophysical survey.</li> <li>Confidence in becoming part of large geophysical survey in charge a specific task.</li> <li>Willingness to learn more about field geophysics.</li> </ul>

Content	In this course, the knowledge on how to make a geological and geophysical surveys will be given. The course includes: exploration concept, planning, geological observation, geological mapping, data acquisition, processing and interpretation. Several geophysical method will be applied on the field, namely: refraction seismic, gravity, magnetic, geoelectrical, and Ground Penetrating Radar			
Study and examination	Midterm test	-	-	
examination	Final Test		15%	
	Presentation, quizzes, homework		10%	
	Field work		35%	
	Report		40%	
Media employed	Slides, beamer, boards, appro communication, internet, exe	opriate softwar ercises etc.	re, online	
Reading list	<ol> <li>Robinson E, C. Coruh, Basic Exploration Geophysics, John Wiley &amp; sons</li> <li>Telford et al., Applied Geophysics, Cambridge Univ. Press, 1976</li> <li>Milsom J., Field Geophysics. John wiley &amp; sons</li> <li>Sheriff, R.E., dan L.P. Geldart, Exploration Seismology. Cambridge Univ. Press, 1995.</li> </ol>			

# 6. Earthquake Seismology

Module designation	Earthquake Seismology	
Module level	Master	
Code, if applicable	TG5031	
Sub-heading, if applicable:	-	
Courses included in the	Earthquake Seismology	
module, if applicable:		
Semester(s) in which	first Semester / first Year	
module is taught		
Module coordinator(s)	Prof. Sri Widiyantoro, Ph.D.	
Lecturer(s)	Prof. Sri Widiyantoro, Ph.D., Dr. Wahyu Triyoso, Dr. Afnimar	, Prof.
	Dr. Andri Dian Nugraha	
Language	Indonesian	
Relation to curriculum	Major Subject / Compulsory Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be	
	pop quizzes, task, or homework in some classes.	$\checkmark$
	Lecturer presents course material using media	
	such as slide in LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class	
	using slide in LCD projector, followed by	
	discussion session. After presentation, they make	
	report what they present before.	
	Tutorial session	
	Lecturer gives students some problem	
	the problem in groups. Lecturer checks how they	-
	solve the problem in turns	
	Class project and discussion	
	Lecturer gives students a project which related to	
	current issues and course material.	`
	Supervision and consultation	
	This activity is continuation of class project.	,
	Students consults problem which they face and	V
	discuss together how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the	
	laboratory according to practical module. Firstly,	_
	laboratory assistant conveys main idea of	-
	practical or experimental. They do the practical	
	afterwards.	
	Field trip	
	Visit field area or company which is related to	-
	course material.	

Workload			
	Class lectures	3 hours	
	Tutorial session	-	
	Supervision and consultation	3 hours	
	Practical or experimental laboratory	work -	
	Individual studies	9 hours	
	Total workload per week	15 hours	
	Presentation	3 hours	
	Class project	12 hours	
	Field trip		
	Total workload per semester	240 hours	
Credit points	3		
Requirements prerequisites			
Learning Goals			
Knowledge	Skill	Competence	
Understanding the	Able to describe     Have the	ability on determining	
concept of seismology a	nd seismic wave and and ana	vzing seismic wave	
its implication to	polarization in phases r	ecorded on a three-	
earthguake.	seismology. compon	ent seismometer.	
<ul> <li>Understanding earthqua</li> </ul>	ke • Able to describe • Familiar	in reading "beach-ball"	
source and mechanism.	source theory of focal me	chanism and its relation	
<ul> <li>Understanding wave</li> </ul>	earthquake. to faulti	ng parameters, and	
propagation through	Able to familiar	in quantifying magnitude,	
medium and its elasticity	/ characterize energy a	nd intensity.	
properties.	properties.		
<ul> <li>Understanding earthqua</li> </ul>	ke mechanic the eart	nquake-fault mechanic	
and fault mechanics,	parameters. paramet	ers.	
deformation and rheolo	gy, • Able to do basic • Have the	ability or basic	
and dislocation model,	deformation knowled	ge to do the basic	
pre- and co-seismic.	modeling. deforma	tion modeling of pre- and	
	co-seism	lic cases.	
Content	1. Introduction: A brief history of	seismology; 2. Stress and	
	strain: the stress tensor, the strain	i tensor, the linear stress-	
	The memory of the seismic w	ave equation and solution.	
	The momentum equation, plane wa	ves, polarization, spherical	
	theony: troval times inversion of	travel times geometrical	
	cheory. traver times, inversion of	traver times, geometrical	
	pormal modes: Love waves, Payleid	a wayes Dispersion Clobal	
	and observing surface waves for	Anisotrony: Rasic physic	
	concent Hooke's low representation	n shear-wave-splitting. 7	
	Seismic moment tensor: definition	the moment tensor and	
	elastic dislocation Figen analysis type of sources 8		
	Farthquake location: hypocentre determination absolute and		
	relative methods: 9. Earthquake ar	d fault mechanics: Force	
	stress and strain. and disloca	tion model: 10. Elastic	
	deformation and rheology: Def	ormation and rheology.	
	dislocation model, pre- and co-seisr	nic.	

Study and examination				
requirements and forms of	Midterm test	$\checkmark$	30%	]
examination	Final Test	$\checkmark$	40%	]
	Presentation, quizzes, homework	$\checkmark$	30%	
	Laboratory work	-	-	]
Media employed	Slides, beamer, boards, app	ropriate softwa	re, online	
	communication, internet, ex	xercises etc.		
Reading list	<ol> <li>Fowler, C.M.R., The Solid Earth: An Introduction to Geophysics, Cambridge University Press, Cambri- edition, 2005.</li> </ol>			obal 2nd
	university press, Se	cond Edition, 20	)09.	lage
	<ol> <li>Stein, S. and Wysession, M., An introduction to seis earthquakes and earth structure, Blackwell pu 2007.</li> </ol>			logy, hing,
	4. Udias, A., Principle Press, Cambridge, 1	e of Seismology 999.	y, Cambridge Unive	rsity
	5. Christopher H. Sch Faulting, Cambridge	olz, The Mecha University Pres	nics of Earthquakes ss, 2002.	and

# 7. Geodynamics and Seismotectonics

Module designation	Geodynamics and Seismotectonics	
Module level	Master	
Code, if applicable	TG6031	
Sub-heading, if applicable:	-	
Courses included in the	Geodynamics and Seismotectonics	
module, if applicable:		
Semester(s) in which	Second Semester / first Year	
module is taught		
Module coordinator(s)	Prof. Sri Widiyantoro, Ph.D.	
Lecturer(s)	Prof. Sri Widiyantoro, Ph.D., Prof. Dr. Andri Dian Nugraha,	Dr.
	Zulfakriza, Dr. Endra Gunawan	
Language	Indonesian	
Relation to curriculum	Major Subject / Compulsory Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be	
	pop quizzes, task, or homework in some classes.	$\checkmark$
	Lecturer presents course material using media	
	such as slide in LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of	
	class using slide in LCD projector, followed by	
	discussion session. After presentation, they make	
	report what they present before.	
	Tutorial session	
	Lecturer gives students some problem	
	beforenand. In class students explain now to	-
	solve the problem in groups. Lecturer checks	
	Class project and discussion	
	Lecturer gives students a project which related to	2
	current issues and course material	v
	Supervision and consultation	
	This activity is continuation of class project.	1
	Students consults problem which they face and	N
	discuss together how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the	
	laboratory according to practical module. Firstly,	_
	laboratory assistant conveys main idea of	_
	practical or experimental. They do the practical	
	afterwards.	
	Field trip	
	Visit field area or company which is related to	-
	course material.	

Workload					
	Class lectures	3 hours			
	Tutorial session	-			
	Supervision and consultation	3 hours			
	Practical or experimental laboratory work -				
	Individual studies	9 hours			
	Total workload per week	15 hours			
	Presentation	3 hours			
	Class project	12 hours			
	Field trip				
	Total workload per semester	240 hours			
Credit points	3				
Requirement prerequisites					

Knowledge	Skill	Competence
<ul> <li>Students understand: tectonics, mantle convection, plate boundary, Wilson cycl spot, triple junction, E interior, kinematics, morphology and deformation; Mechani Force and rheology; an dynamics process.</li> <li>Students understand subduction zone, Wad Benioff zone, and fault plane solution determination</li> <li>Students understand a faults in the world, an seismic hazard.</li> <li>Students understand t dynamics of the plate interiors.</li> <li>Students understand tectonic process relate an earthquake cycle.</li> </ul>	<ul> <li>Able to describe describe principles of plate tectonics, mantle convection, Wilson cycle, hot spot, triple junction, kinematics, morphology and deformation;</li> <li>cs: Mechanics: Force and rheology; and dynamics process.</li> <li>subduction zone, Wadati-Benioff zone, and fault plane solution determination</li> <li>Able to describe active faults and seismic hazard</li> <li>Able to describe the basic for further study related to Earth's plates dynamics.</li> <li>Able to describe the tectonic processes related to an earthquake cycle.</li> </ul>	<ul> <li>Familiar with tectonic processes etc.</li> <li>Familiar with subduction zone worldwide, Benioff zone, and fault plane solution determination</li> <li>Familiar with active faults and seismic hazard</li> <li>Possess an extensive knowledge to describe the basic for further study related to Earth's plate's dynamics.</li> <li>Possess ability to describe the physical process related to an earthquake cycle</li> </ul>
Content	1. Plate tectonics; 2. Mantle converses cycle; 3. Hot spot, triple junction; morphology and deformation; 5. Mer Dynamics process; 7. Earthquakes	ction, Plate boundary, Wilson Earth interior; 4. Kinematics: chanics: Force and rheology; 6. s. subduction. Wadati-Benioff

Study and examination				
requirements and forms of	Midterm test	$\checkmark$	45%	
examination	Final Test	$\checkmark$	45%	
	Presentation, quizzes, homework	$\checkmark$	10%	
	Laboratory work			
Media employed	Slides, beamer, boards, appropriate software, online			
Reading list	<ol> <li>Communication, internet, exercises etc.</li> <li>Stein, S. and Wysession, M.: "An Introduction to Seismology, Earthquakes, and Earth Structure", Wiley, New Jersey, 1991.</li> <li>Scholz, C., H.: "The mechanics of earthquakes and faulting", Cambridge university press, Cambridge, 2002</li> <li>Segall, P.: "Earthquake and Volcano Deformation", Princeton University Press, Princeton, 2010.</li> <li>Turcotte, D.L. and Schubert, G.: "Geodynamics", Cambridge University Press, Cambridge, 2014</li> </ol>			

# 8. Geohazard and Volcano Physics

Module designation	Geohazard and Volcano Physics	
Module level	Master	
Code, if applicable	TG6032	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	Second Semester / first Year	
module is taught		
Module coordinator(s)	Prof.Dr. Antonius Nanang Tyasbudi P. M.Sc.	
Lecturer(s)	Prof.Dr. Antonius Nanang Tyasbudi P. M.Sc., Prof.Dr. Andri D	lian
	Nugraha S.Si., M.Si., Dr. Zulfakriza, S.Si., MT, Dr. rer. nat. Davi	d
	Prambudi Sahara, ST,MT	
Language	Bahasa Indonesia	
Relation to curriculum	Major Subject / Compulsory Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	$\checkmark$
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class	,
	using slide in LCD projector, followed by discussion	
	session. After presentation, they make report what	
	they present before.	
	Lacturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	
	groups Lecturer checks how they solve the problem	
	in turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	
	consults problem which they face and discuss	N
	together how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the	
	laboratory according to practical module. Firstly,	-
	laboratory assistant tell main idea of practical or	
	experimental. They do the practical afterwards.	
	riela trip	
	visit neid area or company which is related to course	-
	laboratory according to practical module. Firstly, laboratory assistant tell main idea of practical or experimental. They do the practical afterwards. Field trip Visit field area or company which is related to course material.	-

WORKIOAU	Class lectures 3 hours						
	Tutorial session -						
	Supervision and consultation	3 hou	'S				
	Practical or experimental laboratory work -						
	Individual studies	Individual studies					
	Total workload per week 15 ho						
	Presentation	Presentation 3 hours					
	Class project 12 hours						
	Field trip						
	Total workload per semester240 hours						
Credit points	3						
Requirements prerequisites							
Learning Goals							
Knowledge	Skill		Competence				
Understanding basic	Able to describe source of	Posse	esses an extensive				
concept of tsunami,	earthquake and tsunami	know	ledge to describe th	ne			
	Able to describe     aarthquake sincle and	basic	for further study				
Inderstanding goobaza	rd volcano seismology	relate	ed to geonazard and	1			
	Able to describe	VOICa					
phenomenon and its	nrobabilistic seismic	Posse	esses ability describe	9			
implication	hazard analysis	the se	eismic nazard				
		analy	515				
Content	1 Earthquake predictions: for	recasting	and prediction	tho			
content	arthquake cycle earthquake triggering searching for precursors						
	approach and application to r	predict eau	rthquake: 2 Farthq	uake			
	hazard: seismicity, magnitude, a	nd intensit	v. estimation of gro	ound			
	motion, probabilistic seismic haz	ard analys	is, deterministic sei	smic			
	hazard analysis, estimating seis	, mic risk, e	empirical and analy	/tical			
	methods of damage estimation	n; 3. Tsun	ami hazard; 4.Vol	cano			
	seismology: seismicity at volcand	oes, origin	of volcano tectonic	and			
	eruption earthquake, source	e proper	ties, volcano-tect	tonic			
	earthquake, earthquake swar	ms, volca	nic tremor, explo	osion			
	earthquake, seismic monitoring,	prediction	of eruption				
Study and examination		.1	25.0/	1			
requirements and forms of	Final Tast	N	35 %	-			
examination	Presentation quizzes	N	35 %				
	homework		30 %				
	Laboratory work	-					
				J			
Media employed	Slides, beamer, boards, appropria	ate softwa	re, online				
	communication, internet, exercis	es etc.					
Reading list	1. Scholz, C., H., The mecha	nics of ear	thquakes and faulti	ng,			
Cambridge university press, Second Edition, 2002							
2. Volcanic Seismology, 1992, Volume 3, ISBN : 978-3-642-							
	<ol> <li>Volcanic Seismology, 199</li> </ol>	02, Volume	3, ISBN : 978-3-642	-			

# 9. Computational Seismology

Module designation	Seismology Computation	
Module level	Master	
Code, if applicable	TG5032	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	Third Semester / second Year	
module is taught		
Module coordinator(s)	Dr. Wahyu Triyoso, M.Sc.	
Lecturer(s)	Dr. Tedi Yudistira, S.Si., M.Si., Dr. Afnimar, M.Sc, Dr. Wahyu	ı
	Triyoso, M. Sc., Dr.rer.nat. Andri Hendriyana, ST,MT	
Language	Bahasa Indonesia	
Relation to curriculum	Major Subject / Compulsory Course	
Type of teaching, contact	Class lectures	
hours	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	
	presents course material using media such as slide in	`
	ICD projector and whiteboard	
	Presentation	
	Students present course materials in front of class	
	using slide in LCD projector followed by discussion	N
	session. After presentation, they make report what	`
	they present before	
	Tutorial session	
	Lecturer gives students some problem beforehand	
	In class students explain how to solve the problem in	-
	groups Lecturer checks how they solve the problem	
	in turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	
	current issues and course material	,
	Supervision and consultation	
	This activity is continuation of class project. Students	
	consults problem which they face and discuss	$\checkmark$
	together how to solve the problem	
	Practical or experimental laboratory work	
	Students do practical or experimental in the	
	laboratory according to practical module. Firstly	_
	laboratory assistant tell main idea of practical or	
	experimental. They do the practical afterwards	
	Field trin	
	Visit field area or company which is related to	_
	course material	
	quizzes, task, or homework in some classes. Lecturer presents course material using media such as slide in LCD projector and whiteboard.PresentationStudents present course materials in front of class using slide in LCD projector, followed by discussion session. After presentation, they make report what they present before.Tutorial session Lecturer gives students some problem beforehand. In class students explain how to solve the problem in groups. Lecturer checks how they solve the problem in turns.Class project and discussion Lecturer gives students a project which related to current issues and course material.Supervision and consultation This activity is continuation of class project. Students consults problem which they face and discuss together how to solve the problem.Practical or experimental laboratory work Students do practical or experimental in the laboratory according to practical module. Firstly, laboratory assistant tell main idea of practical or experimental. They do the practical afterwards.Field trip Visit field area or company which is related to course material.	√ √ √ √ √ −

Workload						
	Class lectures	3 hours				
	Tutorial session	-				
	Supervision and consultation 3 h					
	Practical or experimental laboratory work -					
	Individual studies					
	Total workload per week 15					
	Presentation 3 ho					
	Class project	12 hours				
	Field trip					
	Total workload per semester	240 hours				
Credit points	3					
Requirements prerequisites						

Knowledge	Skill	Competence		
<ul> <li>Understanding the concept of seismology computation.</li> <li>Understanding basic numerical method in seismology</li> <li>Understanding basic concept of green function, convolution, and deconvolution</li> <li>Understanding basic concept of velocity modeling, subsurface imaging</li> </ul>	<ul> <li>Able to understand the numerical method and algorithm in seismology</li> <li>Able to understand the implementation the time series and signal theory in seismology.</li> <li>Able to understand and to do the basic modeling of the subsurface and imaging in seismology</li> </ul>	<ul> <li>Have the ability on implementing the numerical method and algorithm in seismology computation.</li> <li>Could implement the time series and signal processing in seismology.</li> <li>Have the ability or basic knowledge to do the basic subsurface modeling and imaging.</li> </ul>		
Content	1.Seismological instrumentation: seismograms and signals, seismometer and installation; 2.Earthquake monitoring: identifying P- and S-phase, seismic network, inverse problems; 3.Numerical methods in seismology: finite-difference, finite-element, spectral-element, wave propagation in 1D, 2D, 3D; 4.Computational of elastic wave in the earth: elastic waves equations, boundary and initial conditions, seismic sources, scattering, seismic wave problems as linear systems, waves in a discrete world; 5.Reflection seismology: zero-offset sections, common mid-point stacking, source and deconvolution, migration, velocity analysis, receiver function, Kirchhoff theory; 6.Seismic tomography: one-dimensional velocity inversion, linier programming, three-dimensional velocity inversion, delay time tomography, application.			
Study and examination	Midterm test	√ 40%		
	Final Test	√ 40%		
examination	Presentation, quizzes, homework	√ 20%		
	Laboratory work			

Media employed	Slides,	beamer,	boards,	appropriate	software,	online
	commu	inication, inte	ernet, exerc	cises etc.		
Reading list	1.	Shearer, P.,	Introductio	on to seismology	, Cambridge	
	university press, Second Edition, 2009					
	2.	2. Stein, S. and Wysession, M., An introduction to seismology,			mology,	
		earthquake	s and earth	structure, Black	well publishi	ng,
		2007				
	3.	Igel, H., Con	nputational	seismology, Ox	ford, 2017	

# 10. Acquisition and Processing of Seismic Data

Module designation	Acquisition and Processing of Seismic Data	
Module level	Master	
Code, if applicable	TG5122	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	Third Semester / Second Year	
module is taught		
Module coordinator(s)	Prof.Dr.rer.nat. Awali Priyono	
Lecturer(s)	Prof.Dr.rer.nat. Awali Priyono	
Language	Bahasa Indonesia	
Relation to curriculum	Major Subject / Compulsory Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be non	
	quizzes task or homework in some classes. Lecturer	
	presents course material using media such as slide in	
	ICD projector and whiteboard	
	Presentation	
	Studente procent course motoriale in front of close using	
	students present course materials in front of class using	_
	side in LCD projector, followed by discussion session.	-
	After presentation, they make report what they present	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	-
	groups. Lecturer checks how they solve the problem in	
	turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	-
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	
	consults problem which they face and discuss together	-
	how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	
	assistant tell main idea of practical or experimental	
	They do the practical afterwards.	
	Field trin	
	Visit field area or company which is related to assure	
	visit neid area or company which is related to course	-
	material.	

Workload		
	Class lectures	2 hours
	Tutorial session	-
	Supervision and consultation	-
	Practical or experimental laboratory work	4 hours
	Individual studies	4 hours
	Total workload per week	10 hours
	Presentation	-
	Class project	-
	Field trip	-
	Total workload per semester	160 hours
Credit points	2	
Requirements prerequisites	Signal Analysis	

Knowledge		Skill		Competence		
<ul> <li>Advanced exp seismology, seismic hist technology and terminology Advanced theory seism travel time, reflected, re waves, ray geometry, resolution.</li> <li>Knowledge of seismi acquisition, consid objectives and lin parameter, equipmen technic. Land and marine design.</li> <li>Knowledge of seismi processing: prepro seismic velocity analysis, migration and filtering.</li> <li>Knowledge New Technology in Acquisiti Processing</li> </ul>	loration ory and ogy. ic wave efracted Seismic c data eration, t and e survey c data ocessing seismic Seismic on and	•	Good understanding of the equipment and technic of land and marine 2D and 3D seismic acquisition, survey parameter design. Good understanding of 2D and 3D seismic data processing technic, and able to process seismic data from raw data to final stack section. Familiar with industrial seismic processing system software.	•	Able to explain basic concept of exploration seismology. Be able to use basic knowledge of basic concept of exploration seismology to 2D and 3D design of marine and land seismic survey. Be able to find the best processing flow and parameter for a specific seismic data. Be able to process seismic data from filed record to stack migration section	
Content	The topic fundamer subsurfac	cs ntal ce ii	subject are focused int I concept of reflection mage reconstruction for	o s exp	the following subtopics eismic its application opplication opplication opplication	

fundamental concept of reflection seismic its application of subsurface image reconstruction for exploration and exploitation. 2D and 3-D seismic data acquisition and design. Standard processing: geometry setting and formatting, pre-processing, NMO and velocity analysis, migration and filtering. Advance seismic data processing: effect anisotropy in the velocity analysis, velocity analysis and modeling, pre-stack depth migration (PSDM), influence of attenuation in the seismic data and its correction, Converted waves and 3C-processing. Broadband Seismic, Vertical Seismic Profilling, Crosshole Seismic and New Tecnologies.

Study and examination				
requirements and forms of	Midterm test	$\checkmark$	25 %	
examination	Final Test	$\checkmark$	25 %	
	Presentation, quizzes,	N	25 %	
	homework	v	25 /0	
	Laboratory work	-	25 %	
Media employed	Slides, beamer, boards, appropriate software, online			
	communication, internet, exercises etc.			
Reading list	1. Evans, B.J., A Handbook for Seismic Data Acquisition			ו in
	Exploration, SEG, 1997.			
	2. Dondurur, D., Acquisition and Processing of Marine Seismic			
	Data, 1 <sup>st</sup> Edition, 2018			
	3. Sheriff, R. E., Exploration Seismology, Cambridge Univ. Pre			
	1995.			
	4. Onajite, E., Seismic Dat	a Analysis Tecł	nnique for Hydrocar	bon
	Exploration. 1st Edition,	2013.		
	5. Özdogan Yilmaz, <b>Se</b>	ismic Data	Analysis: Process	sing,
	Inversion, and Interpret	ation of Seisn	nic Data, Vol I and	d II,
	Publisher, Society of Exploration Geophysicists, 2001			

## 11. Petroleum System

Module designation	Petroleum System	
Module level	Master	
Code, if applicable	GL5025	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	First Semester / first Year	
module is taught		
Module coordinator(s)	Prof.Dr. Eddy Ariyono Subroto	
Lecturer(s)	Prof.Dr. Eddy Ariyono Subroto	
Language	Bahasa Indonesia	
Relation to curriculum		
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class using	
	slide in ICD projector followed by discussion session	2
	After presentation, they make report what they present	v
	hefore	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	-
	groups. Lecturer checks how they solve the problem in	
	turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	-
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	
	consults problem which they face and discuss together	-
	how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	students to practical or experimental in the laboratory	
		-
	assistant tell main idea of practical or experimental.	
	I hey do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to course	-
	material.	

Workload		
	Class lectures	2 hours
	Tutorial session	-
	Supervision and consultation	-
	Practical or experimental laboratory work	4 hours
	Individual studies	4 hours
	Total workload per week	10 hours
	Presentation	
	Class project	
	Field trip	
	Total workload per semester	160 hours
Credit points	2	
Requirements prerequisites		

<u> </u>		
Knowledge	Skill	Competence
<ul> <li>Understand all components of the petroleum system comprehensively, starting from the pare rock, the maturation of organic matter, migration from the parent rock to the reservoir rock, the cov layer (hood) and calculating the risk of exploration.</li> <li>Understand the meaning of sedimentation basins and their analytical techniques</li> </ul>	<ul> <li>Identify the charge element begins with the deposition of the source rock and the establishment of its volumetric potential, or feedstock, for the system.</li> <li>Identify charge access involves converting this potential to expelled volumes, making, and then moving, the volumes from source bed to trap/reservoir.</li> <li>Understand the unconventional reservoirs, this is within or adjacent to the source bed itself.</li> </ul>	<ul> <li>Able to Integrate geology, geophysics and geochemical information in analyzing the petroleum system</li> <li>Understand hydrocarbon bearing basin: source rock, reservoir, seal trap, migration, and the correct timing of hydrocarbon generation.</li> </ul>
Content	Discussion on every component of source rock, reservoir rock, migra trap and trapping mechanism, ca accumulation. Discussion will also the petroleum system in a hydroo component will be detailly discus among the components will be gi	of a petroleum system including ation from source to reservoir, p-rock and seal, and hydrocarbon o covers risk calculation regarding carbon exploration. Every ssed and an integration evaluation iven to yield a comprehensive

understanding.

Study and examination				
requirements and forms of	Midterm test		40 %	
examination	Final Test		40 %	
	Presentation, quizzes,	1	22.04	
	homework	N	20 %	
	Laboratory work	-		
Media employed	Slides, beamer, boards, appropriate software, online			
	communication, internet, ex	ercises etc.		
Reading list	1. Magoon L.B. and Dow W.G. (ed.), The Petroleum System			
	From Source to Trap, , AAPG Memoir 60, Tulsa., 1994			
	2. Bordenave M.L. (ed.), Applied Petroleum Geochemistry, ,			
	Editions Technip, Paris, 1993 3. Cooper B., Practical Petroleum Geochemistry, , Robertso Scientific Publications, London (UK)., 1990			
	4. Merrill R.K. (ed.), Source and Migration Processes and			
	Evaluation Techniques, , Treatise Petroleum Geology. AAPG,			
	Tulsa, 1991			
# 12. Advanced Rock Physics

Module level         Master           Code, if applicable         TG5225           Sub-heading, if applicable:         -           Courses included in the module, if applicable:         -           Semester(S) in which module is taught         Second Semester / first Year           Module coordinator(S)         Ignatius Sonny Winardhie, Ph.D.           Lecturer(s)         Ignatius Sonny Winardhie, Ph.D. Dr. Fatkhan           Language         Bahasa Indonesia           Relation to curriculum         Major Subject / Compulsory Course           Type of teaching, contact hours         Class lectures Lecturer teaches students in class. There will be pop quizzes, task, or homework in some classes. Lecturer presents course material using media such as slide in LCD projector and whiteboard.           Presentation         Students present course materials in front of class using slide in LCD projector, followed by discussion session. After presentation, they make report what they present before.         v           Class students explain how to solve the problem in groups. Lecturer checks how they solve the problem in turns.         -           Class project and discussion Lecturer gives students a project which related to current issues and course material.         v           Supervision and consultation         v/           This activity is continuation of class project. Students consults problem which they face and discuss together how to solve the problem.         v/	Module designation	Advanced Rock Physics	
Code, if applicable       TG5225         Sub-heading, if applicable:       -         Courses included in the module, if applicable:       -         Semester(s) in which module is taught       Second Semester / first Year         Module coordinator(s)       Ignatius Sonny Winardhie, Ph.D.         Lecturer(s)       Ignatius Sonny Winardhie, Ph.D. Dr. Fatkhan         Language       Bahasa Indonesia         Relation to curriculum       Major Subject / Compulsory Course         Type of teaching, contact hours       Class lectures         Lecturer(s)       Lecturer teaches students in class. There will be pop quizzes, task, or homework in some classes. Lecturer presents course material using media such as slide in LCD projector and whiteboard.         Presentation       Students present course materials in front of class using slide in LCD projector, followed by discussion session. After presentation, they make report what they present before.         Tutorial session       Lecturer gives students some problem beforehand. In class students explain how to solve the problem in groups. Lecturer checks how they solve the problem in Lecturer gives students a project which related to current issues and course material.         Supervision and consultation       V         Class project and discussion       V         Lecturer gives students a project. Students consults problem.       V         Class project and clacourse material.       V <t< td=""><td>Module level</td><td>Master</td><td></td></t<>	Module level	Master	
Sub-heading, if applicable:       -         Courses included in the module, if applicable:       -         Semester(s) in which module is taught       Second Semester / first Year         Module coordinator(s)       Ignatius Sonny Winardhie, Ph.D. Dr. Fatkhan         Language       Bahasa Indonesia         Relation to curriculum       Major Subject / Compulsory Course         Type of teaching, contact hours       Class lectures         Lecturer teaches students in class. There will be pop quizzes, task, or homework in some classes. Lecturer presents course material using media such as slide in LCD projector and whiteboard.       /         Presentation       Students present course materials in front of class using slide in LCD projector, followed by discussion session. After presentation, they make report what they present before.       -         Tutorial session       Lecturer gives students some problem beforehand. In class students explain how to solve the problem in groups. Lecturer checks how they solve the problem in dirty is continuation of class project. Students consults project which related to current issues and course material.       v         Supervision and consultation       This activity is continuation of class project. Students consults problem which they face and discuss to getter how to solve the problem.       v         Class project and discussion       v       supervision and consultation       v         Lecturer gives students a project which related to current issues and course material.       <	Code, if applicable	TG5225	
Courses included in the module, if applicable:         Semester(s) in which module is taught         Module coordinator(s)       Ignatius Sonny Winardhie, Ph.D.         Lecturer(s)       Ignatius Sonny Winardhie, Ph.D. Dr. Fatkhan         Language       Bahasa Indonesia         Relation to curriculum       Major Subject / Compulsory Course         Type of teaching, contact       hours         Class lectures       Lecturer teaches students in class. There will be pop quizzes, task, or homework in some classes. Lecturer veresents course material using media such as slide in LCD projector and whiteboard.         Presentation       Students present course materials in front of class using slide in LCD projector, followed by discussion vissession. After presentation, they make report what they present before.         Tutorial session       Lecturer teaches shudents some problem beforehand. In class students explain how to solve the problem in groups. Lecturer checks how they solve the problem in turns.         Class project and discussion       v         Lecturer gives students a project which related to current issues and course material.       v         Supervision and consultation       This activity is continuation of class project. Students consults problem which they face and discuss together how to solve the problem.       v         Class project and discussion       v       v         Lecturer gives students a project. Students consults problem which they face and discuss together how to solve the	Sub-heading, if applicable:	-	
module, if applicable:       Second Semester / first Year         Semester(s) in which       Second Semester / first Year         Module coordinator(s)       Ignatius Sonny Winardhie, Ph.D.         Lecturer(s)       Ignatius Sonny Winardhie, Ph.D. Dr. Fatkhan         Language       Bahasa Indonesia         Relation to curriculum       Major Subject / Compulsory Course         Type of teaching, contact       hours         Locurer s       Lecturer teaches students in class. There will be pop quizzes, task, or homework in some classes. Lecturer v presents course material using media such as slide in LCD projector and whiteboard.         Presentation       Students present course materials in front of class using slide in LCD projector, followed by discussion v session. After presentation, they make report what they present before.         Tutorial session       Lecturer gives students some problem beforehand. In class students explain how to solve the problem in groups. Lecturer checks how they solve the problem in turns.         Class project and discussion       v         Lecturer gives students a project which related to current issues and course material.       v         Supervision and consultation       This activity is continuation of class project. Students consults problem which they face and discuss together how to solve the problem.       v         Supervision and consultation       Fractical or experimental laboratory work       v         Students do practical or experiment	Courses included in the		
Semester(s) in which module is taught       Second Semester / first Year         Module coordinator(s)       Ignatius Sonny Winardhie, Ph.D.         Lecturer(s)       Ignatius Sonny Winardhie, Ph.D. Dr. F. Fatkhan         Language       Bahasa Indonesia         Relation to curriculum       Major Subject / Compulsory Course         Type of teaching, contact hours       Class lectures         Lecturer teaches students in class. There will be pop quizzes, task, or homework in some classes. Lecturer presents course material using media such as slide in LCD projector and whiteboard.       ✓         Presentation       Students present course materials in front of class using slide in LCD projector, followed by discussion ✓       ✓         Students present before.       Tutorial session       ✓         Tutorial session       Lecturer gives students some problem beforehand. In class students explain how to solve the problem in groups. Lecturer checks how they solve the problem in turns.	module, if applicable:		
module is taught       Ignatius Sonny Winardhie, Ph.D.         Module coordinator(s)       Ignatius Sonny Winardhie, Ph.D. Dr. Fatkhan         Language       Bahasa Indonesia         Relation to curriculum       Major Subject / Compulsory Course         Type of teaching, contact       Nours         Nours       Class lectures         Lecturer teaches students in class. There will be pop       √         quizzes, task, or homework in some classes. Lecturer       √         presents course material using media such as slide in       LCD projector and whiteboard.         Presentation       Students present course materials in front of class         using slide in LCD projector, followed by discussion visession. After presentation, they make report what they present before.       -         Tutorial session       Lecturer gives students some problem beforehand. In class students explain how to solve the problem in groups. Lecturer gives students a project which related to current issues and course material.       √         Class project and discussion       √         Lecturer gives students a project. Students consults problem which they face and discuss together how to solve the problem.       √         Practical or experimental laboratory work Students do practical or experimental in the laboratory according to practical module. Firstly, laboratory according to practical module. Firstly, laboratory assistant tells main idea of practical or experimental.	Semester(s) in which	Second Semester / first Year	
Module coordinator(s)         Ignatius Sonny Winardhie, Ph.D.           Lecturer(s)         Ignatius Sonny Winardhie, Ph.D. Dr. Fatkhan           Language         Bahasa Indonesia           Relation to curriculum         Major Subject / Compulsory Course           Type of teaching, contact         Intervent teaches students in class. There will be pop quizzes, task, or homework in some classes. Lecturer           Nours         Class lectures           Lecturer teaches students in class. There will be pop quizzes, task, or homework in some classes. Lecturer         V           Presents course material using media such as slide in LCD projector and whiteboard.         V           Presentation         Students present course materials in front of class using slide in LCD projector, followed by discussion session. After presentation, they make report what they present before.         V           Tutorial session         Lecturer gives students some problem beforehand. In class students explain how to solve the problem in regroups. Lecturer checks how they solve the problem in turns.         -           Class project and discussion         V         Current issues and course material.           Supervision and consultation         Supervision and consultation         V           Tutorial sersion         Lecturer gives students a project. Students consults problem which they face and discuss         V           Class project and discussion         Lecturer gives students a project which related	module is taught		
Lecturer(s)       Ignatius Sonny Winardhie, Ph.D. Dr. Fatkhan         Language       Bahasa Indonesia         Relation to curriculum       Major Subject / Compulsory Course         Type of teaching, contact       Class lectures         Lecturer teaches students in class. There will be pop quizzes, task, or homework in some classes. Lecturer       √         Presents course material using media such as slide in LCD projector and whiteboard.       √         Presentation       Students present course materials in front of class using slide in LCD projector, followed by discussion       √         Tutorial session       Lecturer gives students some problem beforehand. In class students explain how to solve the problem in groups. Lecturer checks how they solve the problem in turns.       -         Class project and discussion       √         Lecturer gives students a project which related to current issues and course material.       √         Class project and discussion       √         Lecturer gives students a project. Students consults problem which they face and discuss together how to solve the problem.       √         Practical or experimental laboratory work       Students do practical or experimental in the laboratory according to practical or experimental in the laboratory according to practical or experimental in the laboratory acsistant tells main idea of practical or experimental. They do the practical afterwards.	Module coordinator(s)	Ignatius Sonny Winardhie, Ph.D.	
Language       Bahasa Indonesia         Relation to curriculum       Major Subject / Compulsory Course         Type of teaching, contact       Image: Class lectures         hours       Class lectures         Lecturer teaches students in class. There will be pop quizzes, task, or homework in some classes. Lecturer presents course material using media such as slide in LCD projector and whiteboard.       Image: View of teaching, contact presents course materials in front of class using slide in LCD projector, followed by discussion view session. After presentation, they make report what they present before.         Tutorial session       Lecturer gives students some problem beforehand. In class students explain how to solve the problem in groups. Lecturer gives students a project which related to currer tissues and course material.         Class project and discussion       V         Lecturer gives students on consultation       V         Class project and discussion       V         Lecturer gives students on consultation       V         Class project and discussion       V         Lecturer gives students a project. Students consults problem which they face and discuss together how to solve the problem.       V         Preactical or experimental laboratory work       Students do practical or experimental in the laboratory according to practical or module. Firstly, laboratory assistant tells main idea of practical or experimental. They do the practical afterwards.	Lecturer(s)	Ignatius Sonny Winardhie, Ph.D. Dr. Fatkhan	
Relation to curriculum       Major Subject / Compulsory Course         Type of teaching, contact          hours       Class lectures         Lecturer teaches students in class. There will be pop       quizzes, task, or homework in some classes. Lecturer         presents course material using media such as slide in          LCD projector and whiteboard.          Presentation          Students present course materials in front of class          using slide in LCD projector, followed by discussion       √         session. After presentation, they make report what          they present before.          Tutorial session          Lecturer gives students some problem beforehand. In          class project and discussion       √         Lecturer gives students a project which related to       √         current issues and course material.          Supervision and consultation          This activity is continuation of class project. Students       √         current issues and course material.       √         current issues and course material.       √         current issues on consultation          This activity is continuation of class project. Students       √	Language	Bahasa Indonesia	
Type of teaching, contact       Class lectures         Lecturer teaches students in class. There will be pop       ↓         Quizzes, task, or homework in some classes. Lecturer       ↓         presents course material using media such as slide in       LCD projector and whiteboard.         Presentation       Students present course materials in front of class         using slide in LCD projector, followed by discussion       √         session. After presentation, they make report what       they present before.         Tutorial session       Lecturer gives students some problem beforehand. In         class students explain how to solve the problem in       -         groups. Lecturer checks how they solve the problem       in turns.         Class project and discussion       √         Lecturer gives students a project which related to       √         current issues and course material.       Supervision and consultation         This activity is continuation of class project. Students consults problem which they face and discuss together how to solve the problem.       √         Practical or experimental laboratory work       Students do practical or experimental in the laboratory according to practical module. Firstly, laboratory assistant tells main idea of practical or experimental. They do the practical afterwards.	Relation to curriculum	Major Subject / Compulsory Course	
hours       Class lectures         Lecturer teaches students in class. There will be pop       ↓         quizzes, task, or homework in some classes. Lecturer       ↓         presents course material using media such as slide in       LCD projector and whiteboard.         Presentation       Students present course materials in front of class         using slide in LCD projector, followed by discussion       √         session. After presentation, they make report what       they present before.         Tutorial session       Lecturer gives students some problem beforehand. In         class tudents explain how to solve the problem in       -         groups. Lecturer checks how they solve the problem       -         in turns.       Class project and discussion       √         Lecturer gives students a project which related to       √         current issues and course material.       Supervision and consultation       √         This activity is continuation of class project. Students consults problem which they face and discuss together how to solve the problem.       √         Practical or experimental laboratory work       Students do practical or experimental in the laboratory according to practical module. Firstly, laboratory assistant tells main idea of practical or experimental. They do the practical afterwards.         Field trip	Type of teaching, contact		
Lecturer teaches students in class. There will be pop         quizzes, task, or homework in some classes. Lecturer         presents course material using media such as slide in         LCD projector and whiteboard.         Presentation         Students present course materials in front of class         using slide in LCD projector, followed by discussion         session. After presentation, they make report what         they present before.         Tutorial session         Lecturer gives students some problem beforehand. In         class students explain how to solve the problem in         groups. Lecturer checks how they solve the problem         in turns.         Class project and discussion         Lecturer gives students a project which related to         current issues and course material.         Supervision and consultation         This activity is continuation of class project. Students         consults problem which they face and discuss         together how to solve the problem.         Practical or experimental laboratory work         Students do practical or experimental in the         laboratory assistant tells main idea of practical or         experimental. They do the practical afterwards.	hours	Class lectures	
quizzes, task, or homework in some classes. Lecturer       √         presents course material using media such as slide in       LCD projector and whiteboard.         Presentation       Students present course materials in front of class         using slide in LCD projector, followed by discussion       √         session. After presentation, they make report what       they present before.         Tutorial session       Lecturer gives students some problem beforehand. In         class students explain how to solve the problem in       -         groups. Lecturer checks how they solve the problem       -         in turns.       Class project and discussion         Lecturer gives students a project which related to       √         current issues and course material.       Supervision and consultation         This activity is continuation of class project. Students       √         consults problem which they face and discuss       √         together how to solve the problem.       Practical or experimental laboratory work         Students do practical or experimental in the       laboratory assistant tells main idea of practical or         experimental. They do the practical afterwards.       Field trip		Lecturer teaches students in class. There will be pop	
presents course material using media such as slide in LCD projector and whiteboard.         Presentation         Students present course materials in front of class using slide in LCD projector, followed by discussion session. After presentation, they make report what they present before.         Tutorial session         Lecturer gives students some problem beforehand. In class students explain how to solve the problem in groups. Lecturer checks how they solve the problem in turns.         Class project and discussion         Lecturer gives students a project which related to current issues and course material.         Supervision and consultation         This activity is continuation of class project. Students consults problem which they face and discuss together how to solve the problem.         Practical or experimental laboratory work         Students do practical or experimental in the laboratory according to practical module. Firstly, laboratory assistant tells main idea of practical or experimental. They do the practical afterwards.		quizzes, task, or homework in some classes. Lecturer	$\checkmark$
LCD projector and whiteboard.         Presentation         Students present course materials in front of class         using slide in LCD projector, followed by discussion         session. After presentation, they make report what         they present before.         Tutorial session         Lecturer gives students some problem beforehand. In         class students explain how to solve the problem in         groups. Lecturer checks how they solve the problem         in turns.         Class project and discussion         Lecturer gives students a project which related to         current issues and course material.         Supervision and consultation         This activity is continuation of class project. Students         consults problem which they face and discuss         together how to solve the problem.         Practical or experimental laboratory work         Students do practical or experimental in the         laboratory according to practical module. Firstly,         laboratory assistant tells main idea of practical or         experimental. They do the practical afterwards.         Field trip		presents course material using media such as slide in	
Presentation         Students present course materials in front of class         using slide in LCD projector, followed by discussion         session. After presentation, they make report what         they present before.         Tutorial session         Lecturer gives students some problem beforehand. In         class students explain how to solve the problem in         groups. Lecturer checks how they solve the problem         in turns.         Class project and discussion         Lecturer gives students a project which related to         current issues and course material.         Supervision and consultation         This activity is continuation of class project. Students         consults problem which they face and discuss         together how to solve the problem.         Practical or experimental laboratory work         Students do practical or experimental in the         laboratory assistant tells main idea of practical or         experimental. They do the practical afterwards.         Field trip		LCD projector and whiteboard.	
Students present course materials in front of class       √         using slide in LCD projector, followed by discussion       √         session. After presentation, they make report what       they present before.         Tutorial session		Presentation	
using slide in LCD projector, followed by discussion       √         session. After presentation, they make report what       +         they present before.       -         Tutorial session       -         Lecturer gives students some problem beforehand. In       -         class students explain how to solve the problem in       -         groups. Lecturer checks how they solve the problem       -         in turns.       -         Class project and discussion       -         Lecturer gives students a project which related to       √         current issues and course material.       -         Supervision and consultation       -         This activity is continuation of class project. Students       √         consults problem which they face and discuss       √         together how to solve the problem.       -         Practical or experimental laboratory work       -         Students do practical or experimental in the       -         laboratory according to practical module. Firstly,       -         laboratory assistant tells main idea of practical or       -         experimental. They do the practical afterwards.       -		Students present course materials in front of class	
session. After presentation, they make report what they present before.		using slide in LCD projector, followed by discussion	$\checkmark$
they present before.         Tutorial session         Lecturer gives students some problem beforehand. In         class students explain how to solve the problem in         groups. Lecturer checks how they solve the problem         in turns.         Class project and discussion         Lecturer gives students a project which related to         current issues and course material.         Supervision and consultation         This activity is continuation of class project. Students         consults problem which they face and discuss         together how to solve the problem.         Practical or experimental laboratory work         Students do practical or experimental in the         laboratory according to practical module. Firstly,         laboratory assistant tells main idea of practical or         experimental. They do the practical afterwards.		session. After presentation, they make report what	
Tutorial session         Lecturer gives students some problem beforehand. In         class students explain how to solve the problem         in turns.         Class project and discussion         Lecturer gives students a project which related to         current issues and course material.         Supervision and consultation         This activity is continuation of class project. Students         consults problem which they face and discuss         together how to solve the problem.         Practical or experimental laboratory work         Students do practical or experimental in the         laboratory according to practical module. Firstly,         laboratory assistant tells main idea of practical or         experimental. They do the practical afterwards.		they present before.	
Lecturer gives students some problem beforehand. In       -         class students explain how to solve the problem in       -         groups. Lecturer checks how they solve the problem       -         in turns.       -         Class project and discussion       -         Lecturer gives students a project which related to       √         current issues and course material.       -         Supervision and consultation       -         This activity is continuation of class project. Students       √         consults problem which they face and discuss       √         together how to solve the problem.       -         Practical or experimental laboratory work       -         Students do practical or experimental in the       -         laboratory assistant tells main idea of practical or       -         experimental. They do the practical afterwards.       -		Tutorial session	
class students explain how to solve the problem in groups. Lecturer checks how they solve the problem in turns.       -         Class project and discussion       -         Lecturer gives students a project which related to current issues and course material.       √         Supervision and consultation       -         This activity is continuation of class project. Students consults problem which they face and discuss together how to solve the problem.       √         Practical or experimental laboratory work       Students do practical or experimental in the laboratory according to practical module. Firstly, laboratory assistant tells main idea of practical or experimental. They do the practical afterwards.         Field trip       -		Lecturer gives students some problem beforehand. In	
groups. Lecturer checks how they solve the problem in turns.Class project and discussion Lecturer gives students a project which related to current issues and course material.Supervision and consultation This activity is continuation of class project. Students consults problem which they face and discuss together how to solve the problem.Practical or experimental laboratory work Students do practical or experimental in the laboratory assistant tells main idea of practical or experimental. They do the practical afterwards.Field trip		class students explain how to solve the problem in	-
in turns.         Class project and discussion         Lecturer gives students a project which related to         current issues and course material.         Supervision and consultation         This activity is continuation of class project. Students         consults problem which they face and discuss         together how to solve the problem.         Practical or experimental laboratory work         Students do practical or experimental in the         laboratory assistant tells main idea of practical or         experimental. They do the practical afterwards.         Field trip		groups. Lecturer checks how they solve the problem	
Class project and discussion√Lecturer gives students a project which related to current issues and course material.√Supervision and consultationThis activity is continuation of class project. Students consults problem which they face and discuss together how to solve the problem.√Practical or experimental laboratory work Students do practical or experimental in the laboratory according to practical module. Firstly, laboratory assistant tells main idea of practical or experimental. They do the practical afterwards.Field trip		in turns.	
Lecturer gives students a project which related to current issues and course material.       √         Supervision and consultation       This activity is continuation of class project. Students consults problem which they face and discuss together how to solve the problem.       √         Practical or experimental laboratory work       Students do practical or experimental in the laboratory according to practical module. Firstly, laboratory assistant tells main idea of practical or experimental. They do the practical afterwards.         Field trip		Class project and discussion	
current issues and course material.Supervision and consultationThis activity is continuation of class project. Studentsconsults problem which they face and discusstogether how to solve the problem.Practical or experimental laboratory workStudents do practical or experimental in thelaboratory according to practical module. Firstly,-laboratory assistant tells main idea of practical orexperimental. They do the practical afterwards.Field trip		Lecturer gives students a project which related to	$\checkmark$
Supervision and consultationThis activity is continuation of class project. Students consults problem which they face and discuss together how to solve the problem.Practical or experimental laboratory workStudents do practical or experimental in the laboratory according to practical module. Firstly, laboratory assistant tells main idea of practical or experimental. They do the practical afterwards.Field trip		current issues and course material.	
This activity is continuation of class project. Students consults problem which they face and discuss together how to solve the problem.✓Practical or experimental laboratory work Students do practical or experimental in the laboratory according to practical module. Firstly, laboratory assistant tells main idea of practical or experimental. They do the practical afterwards.Field trip		Supervision and consultation	
consults problem which they face and discuss together how to solve the problem.Practical or experimental laboratory work Students do practical or experimental in the laboratory according to practical module. Firstly, laboratory assistant tells main idea of practical or experimental. They do the practical afterwards.Field trip		This activity is continuation of class project. Students	,
together how to solve the problem.Practical or experimental laboratory workStudents do practical or experimental in thelaboratory according to practical module. Firstly,laboratory assistant tells main idea of practical orexperimental. They do the practical afterwards.Field trip		consults problem which they face and discuss	$\checkmark$
Practical or experimental laboratory workStudents do practical or experimental in the laboratory according to practical module. Firstly, laboratory assistant tells main idea of practical or experimental. They do the practical afterwards.Field trip		together how to solve the problem.	
Students do practical or experimental in the laboratory according to practical module. Firstly, laboratory assistant tells main idea of practical or experimental. They do the practical afterwards.Field trip		Practical or experimental laboratory work	
laboratory according to practical module. Firstly,-laboratory assistant tells main idea of practical orexperimental. They do the practical afterwards.Field trip		Students do practical or experimental in the	
laboratory assistant tells main idea of practical or experimental. They do the practical afterwards. Field trip		laboratory according to practical module. Firstly.	-
experimental. They do the practical afterwards. Field trip		laboratory assistant tells main idea of practical or	
Field trip		experimental. They do the practical afterwards.	
		Field trip	
Visit field area or company which is related to course -		Visit field area or company which is related to course	-
material.		material.	

Workload	Class lectures				2 hours	
				2 110013		
	Supervision and consultation			2 hours		
	Practical or experimental laboratory work					
	Individual studi	ies			6 hours	
	Total workload n	er week			10 hours	
	Presentation				2 hours	, 
	Class project				2 110013 8 hours	
	Field trip				0 110013	
	Total workload p	er semester			160 hour	.s
Credit points	2					
Requirements prerequisites						
Learning Goals						
Knowledge			Skill	Com	petence	
Understand how to analy	ze for determining	Able to	solve problems	Pos	sess ability	
lithology, porosity, pore f	luids, and	related	to rock physics	to s	olve	
saturation.		(modell	ing, fluid	pro	blems	
<ul> <li>Understand how to bridg</li> </ul>	es seismic data	substitu	itions, effective	rela	ited to rock	
Inderstand the effects of	and parameters. Evarious rock and		r theories).	pny	SICS	
• Onderstand the effects of	seismic properties	<ul> <li>Able to related</li> </ul>	to seismic	Clia	lienges.	
		anisotro	ppy.			
						<u> </u>
Content	Student are expe	cted to unde	erstand how elas	stic prope	erties of ro	CK
	change when flui	a fills the ro	ck, concept of ef	rective n	iedium	
	theory, physical r	hodelling to	neip understand	u in wave	propagati	on
Study and avamination	and anisotropy o	TTOCK				
study and examination	Midterm test			309	%	
requirements and forms of	Final Test			409	%	
examination	Presentation, qui	zzes,		309	%	
	homework					
	Laboratory work		-			
Media employed	Slides, beamer, b	oards, appro	opriate software	, online		
	communication, i	internet, exe	ercises etc.			
Reading list	1. Avseth, P., M	lukerji, T., ar	nd Mavko., G., 20	005 <i>,</i> Qua	ntitative	
	Seismic Inter	pretation: A	pplying Rock Ph	ysics Too	ls to Reduc	ce
	Interpretatio	n Risk, Camł	oridge Univ. Pres	SS.		
	2. Mavko, G., N	1ukerji, T., ai	nd Dvorkin, J., 19	998, the r	ock physic	S
	handbook: to	ools for seisn	nic analysis in po	orous me	dia:	
	Cambridge Univ. Press.					
	3. Mavko, G., R	ock Physics f	or Geophysical	Reservoi	-	
Characterization and Recovery Monitoring, Rock Physics				hysics		
	laboratory. Stanford University.					
	4. Schon, L. 2004. Physical Properties of Rock <sup>1</sup> Fundamentals and					nd
	rinciples of Petronhysics Elsevier					
	5 Thomson I 2002 Understanding Seismic Anisotrony in					
	5. Thomsen I	Petrophysics	s, Elsevier. standing Seismi	c Anisotr	onv in	
	5. Thomsen, L,	Petrophysics 2002, Under	s, Elsevier. standing Seismi ion, SEG	c Anisotr	opy in	
	5. Thomsen, L, Exploration a	Petrophysics 2002, Under and exploitat	s, Elsevier. standing Seismi ion, SEG. ntals of rock phy	c Anisotro	opy in	ol

### **13.** Advanced Seismic Interpretation

Module designation	Advanced Seismic Interpretation	
Module level	Master	
Code, if applicable	TG5131 (TG5034)	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	Second Semester / first Year	
module is taught		
Module coordinator(s)	Prof. Sigit Sukmono	
Lecturer(s)	Prof. Sigit Sukmono, Dona Sita A., S.T., M.T.	
Language	Bahasa Indonesia	
Relation to curriculum	Major Subject / Compulsory Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	guizzes, task, or homework in some classes. Lecturer	$\checkmark$
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class using	
	slide in LCD projector followed by discussion session	
	After presentation, they make report what they present	
	before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students evaluate how to solve the problem in	
	groups Lecturer checks how they solve the problem in	,
	turns.	
	Class project and discussion	
		2
	current iscues and course material	v
	Supervision and consultation	
	This activity is continuation of class project. Students	-
	consults problem which they face and discuss together	
	now to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	-
	assistant tell main idea of practical or experimental.	
	They do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to course	-
	material.	

Workload		
	Class lectures	3 hours
	Tutorial session	3 hours
	Supervision and consultation	-
	Practical or experimental laboratory work	-
	Individual studies	9 hours
	Total workload per week	15 hours
	Presentation	2 hours
	Class project	13 hours
	Field trip	-
	Total workload per semester	240 hours
Credit points	3	
Requirements prerequisites	TG5122 Advanced Seismic Reflection Data Acquisition	n & Processing.

Knowledge			Skill	Competence		
•	Understanding relations rock-physics parameter with Vp, Vs and densi and then with seism amplitude responses. Understanding how apply knowledge in poin to do seism interpretation minterpretation hydrocarbon explorati which include forwar modeling, well-seismic t stratigraphy & structu interpretation, 3D seism interpretation and analy of lithology-porosity-flui effects. Understanding how to time-depth conversion. Understanding interpretation pitfalls.	of ers ty, nic to t t 1 nic for on ard erd iie, ral nic sis ids do	Able to do related amplitude response forward modeling with the rock physic parameters given. Able to identify the phase, polarity, resolution, lithology-porosity-fluids effects and related pitfalls for the seismic data given. Able to do well-seismic tie, seismic stratigraphy and structural interpretation with the log data given. Able to do time-depth conversion with the velocity function given. Able to define physical properties of the reservoir based on AVO attributes	•	Possess the capability to do seismic interpretation for hydrocarbon exploration and development. Possess reservoir characterization including reservoir geometry delineation, physical properties description and reservoir monitoring	
Conte	ent ( f ( N E	Dbjecti facies, (LST, TS with s (uster stack ir	ive & procedure, principle of can diagenesis, porosity, analysis s ST, HST) and depositional enviro system-tract, rock-physics mo Toksoz, application of seismic nversion for mapping facies, po	rbona seque onme odel attr rosit	ate sedimentation, mod ence, facies, system-tra ent, diagenesis associate : Biot-Gassman, Wan ibutes, pos-stack & pro y and fluids.	el ct ed g, e-

Study and examination			
requirements and forms of	Midterm test	$\checkmark$	30%
examination	Final Test	$\checkmark$	40%
	Presentation, quizzes, homework	$\checkmark$	30%
	Laboratory work	-	-
Media employed	Slides, beamer, boards, appr communication, internet, ex	opriate softwa ercises etc.	re, online
Reading list	<ol> <li>Sukmono, S., Carbon Kuliah, ITB, 2011.</li> <li>Palaz &amp; Marfurt. Car</li> </ol>	ate Seismic Re bonate Seismo	servoir Analysis, Diktat logv. SEG. 1997

### 14. Reservoir Geophysics

Module designation	Reservoir Geophysics	
Module level	Master	
Code, if applicable	TG6041	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	Third Semester / second Year	
module is taught		
Module coordinator(s)	Prof.Dr.Ir. Sigit Sukmono, M.Sc.	
Lecturer(s)	Prof.Dr.Ir. Sigit Sukmono, M.Sc., Dona Sita A., S.T., M.T.	
Language	Bahasa Indonesia	
Relation to curriculum	Major Subject / Compulsory Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	$\checkmark$
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class using	
	slide in LCD projector, followed by discussion session.	
	After presentation, they make report what they present	,
	before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	
	groups. Lecturer checks how they solve the problem in	v
	turns	
	Class project and discussion	
	Lecturer gives students a project which related to	
	current issues and course material	,
	Supervision and consultation	
	This activity is continuation of class project. Students	
	consults problem which they face and discuss together	-
	how to solve the problem	
	Drastical or experimental laboratory work	
	Studente de prestieel er evrenimentel in the leberatery	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	-
	assistant tell main idea of practical or experimental.	
	riele de tre practical afterwards.	
	Visit field area or company which is related to course	-
	material.	

Workload				
	Class	lectures		3 hours
	Tuto	rial session		3 hours
	Supe	ervision and consultation	-	
	Prac	tical or experimental laboratory wo	rk	-
	Indiv	idual studies		9 hours
	Tota	al workload per week		15 hours
	Pre	sentation		2 hours
	Clas	s project		13 hours
	Fiel	d trip		-
	Tota	al workload per semester		240 hours
Credit points	2			
Requirements prerequisites	J TG512	31 (TG5034) Advanced Seismic Inter	nretation	
Learning Goals	1,001,		pretation	
Knowledge		Skill	Comp	etence
Understanding relationsh	ip	<ul> <li>Able to given the log data.</li> </ul>	Possess f	ind the
between rock-physics	•	able to find the reservoirs	most sen	sitive
parameters (such as poro	sity	and the most sensitive	impedan	ce
and water-saturation) and	d V <sub>p</sub> ,	impedance parameters that	paramete	ers for
V <sub>s</sub> , Density.		describe those reservoirs.	character	rizing the
Understanding basic conc	cept	<ul> <li>Able to given the log and</li> </ul>	reservoir.	
of band-limited seismic si	gnal,	seismic data, able to do well-	<ul> <li>Possess c</li> </ul>	hoose
convolution theorem sei	smic	to-seismic the and to do the	inversion	Seismic
amplitude responses, and	4	appropriately	methodo	logies
seismic resolution in relat	tion	<ul> <li>Able to given point 1 and</li> </ul>	which wi	
to previous point.		point 2 ready, able to	handle th	ie
<ul> <li>Understanding basic cond</li> </ul>	cept	choose, perform and deliver	reservoir	
of inversion methodology		the most appropriate	character	rization
applied to seismic data.		seismic inversion.	tasks	
• Understanding how to an	alyze	<ul> <li>Able to given point 3 ready,</li> </ul>	appropria	ately.
post-stack and pre-stack		able to interpret them in	<ul> <li>Possess d</li> </ul>	leliver and
seismic data as a respons	e of	terms of reservoir	interpret	the seismic
impedance contrast.		properties.	inversion	results in
Understanding a number	of		terms of	reservoir
seismic inversion			propertie	s.
methodologies along with	า			
their limitations and				
advantages.				
<ul> <li>Understanding now to interpret solemic inversio</li> </ul>	n			
results and nitfalls	11			
Content	Integr	ated reservoir management, role	e of seismic	in reservoir
	analys	sis, AI inversion, complex attributes	, amplitude a	attributes and
	AVO a	attributes for reservoir characteriz	ation (reserv	oir geometry
	deline	ation, physical properties de	scription ar	nd reservoir
	monit	oring)		

Study and examination requirements and forms of	Midterm test	$\checkmark$	30%		
	Final Test	$\checkmark$	40%		
examination	Presentation, quizzes, homework	$\checkmark$	30%		
	Laboratory work	-	-		
Media employed	Slides. beamer. boards	. appropriat	e software. onli	ine	
. ,	communication, internet, ex	ercises etc.			
Reading list	1. Sukmono, S., Lithology,	Facies, Porosit	y, Fracture and Fluids	5	
	Analysis using Seismic data, Diktat Kuliah ITB, 2002.				
	2. Sheriff, Reservoir Geop	hysics, SEG, 199	95		

# 15. Advanced Gravity and Magnetic Method

Module designation	Advanced Gravity and Magnetic Method	
Module level	Master	
Code, if applicable	TG5161	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	First Semester / first Year	
module is taught		
Module coordinator(s)	Prof.Dr. Wawan Gunawan A. Kadir, MS	
Lecturer(s)	Prof.Dr. Wawan Gunawan A. Kadir, MS	
Language	Bahasa Indonesia	
Relation to curriculum	Major Subject / Compulsory Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be	
	pop quizzes, task, or homework in some classes.	$\checkmark$
	Lecturer presents course material using media such	
	as slide in LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class	
	using slide in LCD projector, followed by discussion	$\checkmark$
	session. After presentation, they make report what	
	they present before.	
	Tutorial session	
	Lecturer gives students some problem beforehand.	
	In class students explain how to solve the problem	$\checkmark$
	in groups. Lecturer checks how they solve the	
	problem in turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	$\checkmark$
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project.	1
	Students consults problem which they face and	$\checkmark$
	discuss together how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the	
	laboratory according to practical module. Firstly.	_
	laboratory assistant tell main idea of practical or	
	experimental. They do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to	
	course material.	Y

Workload					
	Cla	ass lectures		3 hours	
	Tu	torial session		2 hours	
	Supervision and consultation			2 hours	
	Pra	Practical or experimental laboratory work			
	Inc	lividual studies		9 hours	
	To	tal workload per week		15 hours	
	Pre	esentation		2 hours	
	Cla	iss project		20 hours	
	Fie	ld trip		8 hours	
	To	tal workload per semester		240 hours	
Credit points	2				
Requirements prerequisites	5				
Learning Goals					
Knowledge		Skill	Compoton	<u></u>	
Kilowiedge			Tal		
Understand basic concept     and background of arrowing	ρτ tv	<ul> <li>Able to apply gravity</li> <li>and magnetic methods</li> </ul>	<ul> <li>Take possession</li> </ul>	oblom	
and magnetic methods	ιy	in order to solve the	capability for pr	se of	
and magnetic methods.		nrohlem of	gravity and mag	netic	
Understand density and		exploration	evoloration en	vironmental	
susceptibility distribution	n in	environmental and	and geological h	azard	
the subsurface based on		hazard mitigation.		docign	
topography		Eamiliar in designing	<ul> <li>Has capability to design gravity and magnetic surveys for exploration</li> </ul>		
topography.	e f	gravity and magnetic			
Onderstand the concept     gravity and magnetic	. 01	surveys based on	environmental	and	
gravity and magnetic		objective of the survey	geological hazar	d.	
		and its spectral	Eamiliar in analy	usis of	
between green function	and	anomalies response	<ul> <li>residual-regional</li> </ul>	al gravity	
density/suscentibility	unu	<ul> <li>Understand to do</li> </ul>	and magnetic ar	nomalies	
contrast.		regional and residual	because of its	iomanes	
Understand on design of	f	gravity and magnetic	decomposition	orocesses.	
gravity and magnetic dat	ta	anomalies separation	<ul> <li>Canable to do q</li> </ul>	ualitative	
survey based on objectiv	ve of	using some methods,	and quantitative		
the survey and its spectr	ral	and its characteristic	interpretation o	f gravity	
anomalies response.	-	relating with objective	and magnetic ar	nomalies	
Understand gravity and		of the survey	using the schem	e of	
magnetic anomaly		• Familiar on qualitative	forward and inv	ersion	
decomposition through		and quantitative	modeling.		
regional and residual		interpretation of	Has capability to	apply	
separation process.		gravity and magnetic	gravity and mag	netic	
Understand basic conce	ept	anomalies using the	method to optir	nize the	
of qualitative and		scheme of forward and	result of explora	ation,	
quantitative interpretati	on	inversion modeling.	environmental a	and	
through forward and		Able to analysis the	geological hazar	d.	
inversion modeling, and	its	exploration problem			
application on exploration	on	using gravity and			
activity.		magnetic methods.			

Content	Historical perspective of gravity and magnetic methods, Concept of gravity and magnetic method in natural resources exploration and its example, density and susceptibility of rocks, basics theory, gravity anomaly, gravity corrections, gravimeter, main and outer magnetic field, magnetic corrections, magnetometer, gravity and magnetic design survey, field operation of gravity and magnetic survey, estimation of density from gravity data, separation of regional-residual anomaly, qualitative interpretation, quantitative interpretation through forward and inversion modeling, cases of gravity and magnetic application for exploration and tectonic setting analysis						
Study and examination							
requirements and forms of	Midterm test	$\checkmark$					
examination	Final Test	$\checkmark$	oqual				
	Presentation, quizzes,	al	equai				
	homework	N					
	Laboratory work	-	-				
Media employed	Slides beamer boards appr	opriate softwa	re online				
Media employed	communication, internet, ex	ercises etc.	re, onnie				
Reading list	1. Grant & West, Interpreta	ation Theory in	Applied Geophysics	•			
Ŭ	Mc. Graw-Hill, 1969.	,	,				
	2. W.M Telford, L.P Geldart	t, R.E Sheriff, ar	nd D.A Keys, Applied				
	Geophysics, Cambridge U	University Pres	s, 1988.				

### 16. Advanced Geoelectrical Method

Module designation	Advanced Geoelectrical Method	
Module level	Master	
Code, if applicable	TG5162	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	first semester / first Year	
module is taught		
Module coordinator(s)	Dr. Wahyudi Widyatmoko Parnadi	
Lecturer(s)	Dr. Wahyudi Widyatmoko Parnadi, Dr. Widodo	
Language	Bahasa Indonesia	
Relation to curriculum	Major Subject / Compulsory Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	$\checkmark$
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class	
	using slide in LCD projector, followed by discussion	
	session. After presentation, they make report what	
	they present before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	
	groups. Lecturer checks how they solve the problem in	,
	turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	
	consults problem which they face and discuss together	$\checkmark$
	how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	
	assistant tell main idea of practical or experimental	Y
	They do the practical afterwards	
	Field trin	
	Visit field area or company which is related to course	2
	material	N

	1			
Workload	Class lectur	es		2 hours
	Tutorial ses	sion		1 hours
	Supervision and consultation			1 hours
	Practical or experimental laboratory work		2 hours	
	Individual studies		4 hours	
	Total worklo	ad nor wook		
	Procontation			2 hours
	Class project			2 hours
	Class project			2 nours
	Field trip			10 nours
		au per semester		100 110015
Credit points	2			
Requirements prerequisites				
Learning Goals				
Knowledge		Skill	Compete	ence
Understand basic know	ledge of four	Able to measure	• Familiar in	conducting
geoelectrical methods	(D-resistivity,	soil/rock samples	electrical ar	nd
Self-Potential, Induced	Polarization,	in a laboratory	magnetic p	roperties
and Electromagnetic m	ethods)	Able to conduct	in a laborat	ory
<ul> <li>Understand electric (re</li> </ul>	sistivity,	and develop	• Familiar in	planning
permittivity) and magn	etic	single or multiple	and designi	ing
(magnetic permeability	) properties	geoelectrical	complex	0
of soils and rocks in-de	pth	methods in the	geoelectric	al survevs
<ul> <li>Understand how to me</li> </ul>	asure electric	field	Familiar in	leading
and magnetic propertie	es in a	<ul> <li>Able to process</li> </ul>	conducting	
laboratory		analyze and	nrocessing	analysis
<ul> <li>Understand how to conduct and</li> </ul>		interpret complex	and internr	eting
develop geoelectrical p	naacuramant	geoelectrical data	compley	cuing
in a field	leasurement	• Able to convert	geoelectric	al dataset
In a new		Able to convert     multiple	Eamiliar in	convorting
Onderstand now to pro	ncess,	multiple	<ul> <li>Farminar in o multiple go</li> </ul>	colloctrical
analyze, and interpret of	Joinplex	geoelectrical	soction/ma	
			section/ma	p into
Understand now to cor	ivert a	geological	geology set	LION/Map
multiple geoelectrical s	ection/map	section/map		
Into a geological sectio	n/map			
Content	The role of D	C-resistivity, Self-Potenti	al (SP) & Induce	d Polarization
	(IP) in explora	ation; advantages & limi	tation of the me	ethods; depth
	of penetration	on; resistivity anisotro	py concepts; I	Dar Zarrouck
	parameters;	coefficient anisotropy; l	ateral and verti	cal resistivity;
	principles of	exploration using DC-re	esistivity, SP & I	P; misse a la
	masse technique, azimuthal resistivity survey (ARS), geoelectrical			
	tomography;	application of DC-resis	tivity, SP and II	P methods in
	environmenta	al conservation;	geothermal,	geotechnical
	applications;	hydrogeology studies; pi	ractical works of	DC-resistivity
	method with	4 electrodes, of SP	and IP with m	ulti-electode;

papers.

seminar/presentation about techniques to solve problems by using resistivity, SP and IP methods through case studies apperde in latest

Study and examination				
requirements and forms of	Midterm test	√ 35%		
examination	Final Test	√ 35%		
	Presentation, quizzes,	√ 20%		
	Laboratory work	- 10%		
		10/0		
Media employed	Slides, beamer, boards, appropria	ate software, online		
	communication, internet, exercise	ses etc.		
Reading list	1. Bhattacharya, P. N., and I	Patra, H. P., 1968, SEGJ, Direct		
	Current Geoelectric Soun	nding: Elsevier, 135pp.		
	2. Binley, A., and Slater, L., 2	2020, Resistivity and Induced		
	Polarization: Theory and	Applications to the Near-Surface		
	Earth: Cambridge Univ. Press, 334pp.			
	3. Nabighian M.N., (ed.), 1989, Electromagnetic Methods in			
	Applied Geophysics, Vol.2	.1. Theory, Vol.2 Application,		
	Society of Exploration Geophysicists.			
	4. Parnadi, W. W., 2008, Me	. Parnadi, W. W., 2008, Metode Geolistrik: diktat kuliah.		
	5. Sheriff, R. E., 2002, Encyc	clopedic Dictionary of Applied		
	Geophysics: SEG, 4 <sup>th</sup> ed.,	429pp.		
	6. Strack, KM., 1992, Explo	oration with Deep Transient		
	Electromagnetics: Elsevie	er, 373pp.		
	7. Telford, W. M., L. P. Geld	lart, and R. E. Sheriff, 1990,		
	Applied Geophysics, Cam	nbridge University Press, 2ed.		
	8. Parnadi, W. W., 2008, Dik	ktat kuliah TG5146 Eksplorasi		
	Geolistrik			
	9. Kelly W. E. and S. Mares,	, 1993, Applied Geophysics in		
	Hydrogeological and Engi	ineering Practice.		
	10. latest papers in internation	ional journals in the last five years		

# 17. Mining Geophysics

Module designation	Mining Geophysics	
Module level	Master	
Code, if applicable	TG5042	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	Second Semester / first Year	
module is taught		
Module coordinator(s)	Dr.Ir. Agus Laesanpura, MS	
Lecturer(s)	Dr.Ir. Agus Laesanpura, MS	
	Dr.rer.nat. Widodo	
Language	Bahasa Indonesia	
Relation to curriculum	Major Subject / Compulsory Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	$\checkmark$
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class	
	using slide in LCD projector, followed by discussion	-
	session. After presentation, they make report what	
	they present before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	$\checkmark$
	groups. Lecturer checks how they solve the problem	
	in turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	$\checkmark$
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	
	consults problem which they face and discuss	-
	together how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the	
	laboratory according to practical module. Firstly,	-
	laboratory assistant tell main idea of practical or	
	experimental. They do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to course	-
	material.	

Workload		
	Class lectures	3 hours
	Tutorial session	3 hours
	Supervision and consultation	-
	Practical or experimental laboratory work	-
	Individual studies	9 hours
	Total workload per week	15 hours
	Presentation	-
	Class project	15 hours
	Field trip	-
	Total workload per semester	240 hours
		·
Credit points	3	
Requirements prerequisites		

0			
Knowledge	Skill	Competence	
<ul> <li>Understand mining methods (surface and underground methods)</li> <li>Understand geophysica method used in ore exploration.</li> <li>Understand geophysica responses to ore trap</li> <li>Understand geophysica modeling and interpretation in the exploration of ore mining.</li> </ul>	<ul> <li>Able to apply geophysical methods in the cases of mining exploration.</li> <li>Familiar in the modeling of geophysical data in order to explore of earth mineral resources.</li> <li>Familiar in interpretation of geophysical data in the scheme of exploration earth and mineral resources.</li> </ul>	<ul> <li>Able to apply geophysical methods in the cases of mining exploration.</li> <li>Familiar in the modeling of geophysical data in order to explore of earth mineral resources.</li> <li>Familiar in interpretatio of geophysical data in the scheme of exploration earth and mineral resources.</li> </ul>	n
Content	Providing concept mining metho well as its model in nature, n responses to ore traps, Geophysi practice. Several common geoph such as gravimetry, magnetic, ge intro. to petrophysics.	ds, and (rock & mineral) geneti netalogenic province, geophysical interpretation and modellir nysical method used in ore fine eoelectric, electromagnetisme	c as sical ig in ding and
Study and examination requirements and forms of examination	Midterm test Final Test Presentation, quizzes, homework Laboratory work	√         40 %           √         40 %           √         20 %           -         -	
Media employed	Slides, beamer, boards, communication, internet, exercis	appropriate software, on es etc.	line

Reading list	1.	Introductory mining Engineering, H.L. Hartman		
	2.	Edwin S. Robinson, Cahit Coryh. Basic Exploration		
		Geophysics. John Willey and Sons, 1988.		
	3.	Evans, Anthony M. Ore Geology and Industrial Minerals : An		
		Introduction. Blackwell Scientific Publications, 1993.		
	4.	Hansen, Don Ed. Mining Geophysics. SEG, 1969.		
	5.	Jensen, M. Alan M. Bateman. Economic Mineral Deposit.		
		John Willey and Sons, 1981.		
	6.	Gueguen, Yves. Introduction a'la Physique des roches.		
		Herman Paris, 1992.		

# 18. Geothermal Exploration

Module designation	Geothermal Exploration	
Module level	Master	
Code, if applicable	TG5043	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	Second Semester / first Year	
module is taught		
Module coordinator(s)	Prof.Dr. Hendra Grandis	
Lecturer(s)	Prof.Dr. Hendra Grandis	
Language	Bahasa Indonesia	
Relation to curriculum	Major Subject / Compulsory Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	$\checkmark$
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class	
	using slide in LCD projector, followed by discussion	-
	session. After presentation, they make report what	
	they present before.	
	Tutorial session	
	Lecturer gives students some problem beforehand.	
	In class students explain how to solve the problem in	$\checkmark$
	groups. Lecturer checks how they solve the problem	
	in turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	$\checkmark$
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	
	consults problem which they face and discuss	
	together how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the	
	laboratory according to practical module. Firstly,	-
	laboratory assistant tell main idea of practical or	
	experimental. They do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to course	-
	material.	
	•	

Workload		
	Class lectures	2 hours
	Tutorial session	1 hour
	Supervision and consultation	1 hour
	Practical or experimental laboratory work	-
	Individual studies	6 hours
	Total workload per week	10 hours
	Presentation	-
	Class project	30 hours
	Field trip	-
	Total workload per semester	160 hours
Credit points	2	
Requirements prerequisites		

Knowledge	Skill	Competence
<ul> <li>Geothermal system and inter-disciplinary context of geothermal exploration</li> <li>Geophysical signatures of a geothermal prospect</li> <li>Exploration strategy in general and geophysics in particular</li> <li>The role of geophysical methods in geothermal exploration</li> <li>Conceptual model of geothermal prospect</li> <li>Case studies of well-known geothermal fields</li> </ul>	<ul> <li>Elaboration of relationship between geothermal phenomena, surface manifestations etc. with regional geological setting</li> <li>Design of geophysical survey both for preliminary and advanced surveys</li> <li>Geophysical data processing and modelling</li> <li>Interpretation of geophysical data and models</li> </ul>	<ul> <li>Take possession of Identification of a geothermal prospect from desk study of available data</li> <li>Planning and managing geophysical survey campaign, at least conceptually, given existing preliminary data</li> <li>Integration of geophysical survey results both for preliminary and advanced stage of geothermal exploration</li> <li>Building conceptual model of geothermal prospect</li> </ul>

Content	Elements of a geothermal system, types of geothermal system, Brief review of geology and geochemistry of geothermal system.General exploration strategy (reconnaissance survey, detailed survey) and development. Geophysical signatures of a geothermal prospect:gross structure, reistivity and magetic property of cap			
	rocks, desity of magmatic hea	at sources, ther	mal fluid flow, seismi	city
	of hydrothermal activities.	Review of §	geophysical explorat	tion
	methods: gravity, magnetics	, geo-electrics	(Schlumberger, Mise	e-a-
	la-masse), magnetotellurics	(MT, including	g CSAMT and transi	ient
	EM), Self-Potential(SP), micro	o-seismics. Con	ceptual model, resou	irce
	exploration	cussion on cas	e studies of geother	mai
Study and examination				
requirements and forms of	Midterm test	$\checkmark$	30 %	
examination	Final Test	$\checkmark$	30 %	
	Presentation, quizzes,	2	40 %	
	homework	v	10 / 0	
	Laboratory work	-	-	
Media employed	Slides, beamer, boards, appr	opriate softwa	re, online	
	communication, internet, ex	ercises etc.		
Reading list	1. Gupta, H., Roy, S., Geo	thermal Energy	: An Alternative	
	Resource for 21st Cent	ury, Elsevier, 2	007.	
	2. Long, L.T. and Kaufann	, R.D., Acquisiti	ion and Analysis of	
	Terrestrial Gravity Data	a, Cambridge U	niversity Press, 2013	•
	3. Fairhead, J.D., Advances in Gravity and Magnetic Processing			
	and Inter-pretation, EAGE Publishing, 2015.			
	4. Simpson, F. & Bahr, K., Practical Magnetotellurics,			
	Chambridge			
	5. University Press, 2005.			

Module designation	Advanced Engineering and Environmental Geophysics	
Module level	Master	
Code, if applicable	TG6044	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	Second Semester / first Year	
module is taught		
Module coordinator(s)	Dr.rer.nat.Ir. Wahyudi Widyatmoko Parnadi, MS	
Lecturer(s)	Dr.rer.nat.Ir. Wahyudi Widyatmoko Parnadi, MS	
Language	Bahasa Indonesia	
Relation to curriculum	Major Subject / Compulsory Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	$\checkmark$
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class	
	using slide in LCD projector, followed by discussion	
	session. After presentation, they make report what	
	they present before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	
	groups Lecturer checks how they solve the problem in	,
	turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	-
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	
	consults problem which they face and discuss together	-
	how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	_
	assistant tell main idea of practical or experimental	
	They do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to course	N
	material.	Y

# **19.** Advanced Engineering and Environmental Geophysics

Workload		
	Class lectures	2 hours
	Tutorial session	2 hours
	Supervision and consultation	-
	Practical or experimental laboratory work	-
	Individual studies	6 hours
	Total workload per week	10 hours
	Presentation	8 hours
	Class project	-
	Field trip	12 hours
	Total workload per semester	160 hours
Credit points	2	
Requirements prerequisites	-	

Knowledge	Skill	Competence		
<ul> <li>Understand b knowledge of geophys methods</li> <li>Understand enginee and physical properties soil and rocks</li> <li>Understand problems engineering environment (EE)</li> <li>Understand to match g physical methods to ap cation in EE</li> <li>Understand to cono plan and design a geophysical survey</li> <li>Understand to process interpret EE geophys data</li> </ul>	<ul> <li>Able to recognize problems in EE</li> <li>Know the basics of exploration methods in geotechnical engineering, geological engineering, and hydrology</li> <li>Able to select the appropri-ate geophysical methods suitable for distinct EE problems</li> <li>Able to plan and develop base survey design for engineering and environmental purposes</li> <li>Able to conduct basic processing&amp; interpretation of EE geophysical data</li> </ul>	<ul> <li>Planning and designing a EE geophysical survey</li> <li>Lead and conduct a EE geophysical survey</li> <li>Process and interpret EE geophysical data</li> <li>Providing basic conclusions and recommendations for a geophysical survey</li> </ul>		
Content	ntroduction: the meaning and rong ngineering and environmental pro-	ble of geophysics for solving blems, case examples of the		
	application of engineering and environmental geophysics: physic			

engineering and environmental problems, case examples of the application of engineering and environmental geophysics; physical and engineering properties; methodology of geotechnical investigation: sounding, boring etc.; engineering seismology: seismic reflection and refraction; earthquake risk analysis; seismic and nonseismic (gravity, magnetic, DC-resistivity, electromagnetics) investigation as well as well logging for hydrogeology, geotechnical engineering and environment; geohazards: landslide and other phenomenon; case studies.

Study and examination					
requirements and forms of	Midterm test		35%	]	
examination	Final Test	$\checkmark$	35%		
	Presentation, quizzes, homework	$\checkmark$	20%		
	Laboratory work		10%		
				-	
Media employed	Slides, beamer, boards, appropriate software, online				
	communication, internet, exercises etc.				
Reading list	1. Beblo, M. (ed.); 1997; Umweltgeophysik, Ernst & Sohn,				
	465pp.				
	2. Burger, H. R., 1992,	Exploration Ge	ophysics of the Shall	ow	
	Subsurface: Prentic	e Hall, 489pp. IS	SBN 0-13-296773-1.		
	3. Cheng, Y. M., Lau, C	. K., 2014, Slope	e Stability Analysis a	nd	
	Stabilization: CRC P	ress, Taylor & F	rancis Group, 2 <sup>nd</sup> ed.	,	
	426pp. ISBN 978-1-	4665-8284-2.			
	4. Reynolds, J. M., 2011, An introduction to applied and				
	environmental Geophysics: John Wiley & Sons, 2 <sup>nd</sup> ed.,				
	696pp. ISBN 978-0471-485360.				
	5. Fetter, C. W., 2001, Applied Hydrogeology: Prentica-Hall,				
	Inc., 4 <sup>th</sup> ed., 598pp. ISBN 0-13-088239-9.				
	6. Mavko, G., Mukerji, I., Dvorking, J., 2009, The Rock Physics				
		Handbook: Cambridge University Press, 2 <sup>nd</sup> ed., 511pp.			
	ISBN 978-0-511-650	Computational	Engineering Coolegy		
	Prentice-Hall, Inc., 3	22 pp.	Engineering Geology	',	
	8. Kevs. W. S.: 1997: A	Practical Guide	to Borehole Geoph	vsics	
	in Environmental In	vestigations. SR	C Press. Inc., 176 pp		
	9. Sharma P. V. 1997	Environmenta	l and Engineering	•	
	Geophysics: Cambr	dge University			
	10 Rubin & Hubbard (F	de ). 2005. Hvd	rogeonhysics: Elsevi	or	
	11 Parpadi W/W/ 200	8 Diktat Kuliah	Goofisika Toknik dar	сı. h	
	Lingkungan	o, Diktat Kullali	Geolisika Tekilik uai	•	
	Lingkungan.	a (Eda.) 2008	According and Manag	ina	
	Earthquaka Dick: Co	a (Eus.), 2008, A ringor	noocoonig and widfidg	SIIIR	
		ringer. Sootoobaioal 5-	uthau also Francis	~.	
	Springer.	seotechnical Ea	runquake Engineerin	ig;	
	14. latest papers in international journals in the last five ye				

# 20. Advanced Geophysical Inversion Method

Module designation	Advanced Geophysical Inversion Method	
Module level	Master	
Code, if applicable	TG5023	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	First Semester / first Year	
module is taught		
Module coordinator(s)	Prof.Dr. Hendra Grandis	
Lecturer(s)	Prof.Dr. Hendra Grandis	
Language	Bahasa Indonesia	
Relation to curriculum	Elective Subject / Elective Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	guizzes, task, or homework in some classes. Lecturer	
	presents course material using media such as slide in	
	ICD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class using	
	slide in LCD projector followed by discussion session	
	After procentation, they make report what they procent	-
	After presentation, they make report what they present	
	Defore.	
	Lecturer gives students some problem beforehand. In	1
	class students explain how to solve the problem in	ν
	groups. Lecturer checks how they solve the problem in	
	turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	$\checkmark$
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	
	consults problem which they face and discuss together	N
	how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	_
	assistant tell main idea of practical or experimental	
	They do the practical afterwards	
	Field trin	
	Visit field area or company which is related to course	
	which is related to company which is related to course	-

Workload		
	Class lectures	2 hours
	Tutorial session	1 hours
	Supervision and consultation	1 hours
	Practical or experimental laboratory work	-
	Individual studies	6 hours
	Total workload per week	10 hours
	Presentation	-
	Class project	30 hours
	Field trip	-
	Total workload per semester	160 hours
Credit points	2	
Requirements prerequisites		

	Knowledge	Skill	Competence
	<ul> <li>Basic concept c geophysical modelling</li> <li>Data and mode parameter relationship i geophysical modelling</li> <li>Concept of forwar modelling</li> <li>Concept of invers modelling</li> </ul>	<ul> <li>f Formulation of general forward problem in geophysics</li> <li>Formulation of linear relationship between data and model parameters</li> <li>Resolving various linear inverse problem in geophysics</li> <li>Formulation of non-linear relationship between data and model parameters</li> <li>Resolving various non-linear inverse problem in geophysics</li> </ul>	<ul> <li>Basic to intermediate programming in Matlab or Phyton</li> <li>Programming forward modelling in geophysics</li> <li>Programming inverse modelling in geophysics</li> <li>Implementation of several nature-inspired, population-based optimization algorithm for non-linear inverse problem resolution</li> </ul>
Со	ntent	Concept of geophysical modeling, cor inverse modeling, solving linear r principle, formulation of linear inversi inversion, weighted linear inversio formulation of nonlinear inverse pro non-linear inversion, global appro systematic/grid search, random se guided random search method, s genetic algorithm.	icept of forward modeling and egressionusing least-squares a problems, solution of linear n, damped linear inversion blems, linearized approach o ach of nonlinear inversion earch, Monte-Carlo method imulated annealing method

Study and examination					
requirements and forms of	Midterm test	$\checkmark$	30%		
examination	Final Test	$\checkmark$	30%		
	Presentation, quizzes,		400/		
	homework	N	40%		
	Laboratory work	-	-		
Media employed	Slides, beamer, boards, appropriate software, online				
	communication, internet, exercises etc.				
Reading list	1. Menke, W., Geophysical Data Analysis: Discrete Inverse Theory, Academic Press, 1989.				
	2. Tarantola, A., Inverse	e Problem Theo	ory: Methods for Data		
	Fitting and Model Pa	rameter Estima	ation, Elsevier, 1987.		
	3. Sen, M.K., Stoffa, P.L., Global Optimization Methods in				
	Geophysical Inversio	n, Elsevier, 199	95		
	4. Grandis, H., Penganta	ar Inversi Geof	isika, HAGI, 2009		

### 21. Geoscience Summer School

Module designation	Geoscience Summer School	
Module level	Master	
Code, if applicable	TG5025	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	First Semester / First Year	
module is taught		
Module coordinator(s)	Dr. rer. nat. R. Mohammad Rachmat Sule, S.T, M.T.	
Lecturer(s)	Dr. rer. nat. R. Mohammad Rachmat Sule, S.T, M.T.	
Language	Bahasa Indonesia	
Relation to curriculum	Elective Subject / Elective Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	$\checkmark$
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class using	
	slide in LCD projector followed by discussion session	_
	After procentation, they make report what they procent	-
	After presentation, they make report what they present	
	lutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	$\checkmark$
	groups. Lecturer checks how they solve the problem in	
	turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	
	consults problem which they face and discuss together	$\checkmark$
	beinte selve the problem which they face and discuss together	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	-
	assistant tell main idea of practical or experimental.	
	They do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to course	-
	material.	

Workload						
	Class lect	tures			2 hours	
	Tutorial session				2 hours	
	Supervisi	2 hours				
	Practical	or experimental lab	oratory worl	<b>(</b>	-	
	Individua	Individual studies				
	Total wo	rkload per week			9 hours	
	Presenta	tion				
	Class pro	oject			16 hours	
	Field trip					
	Total wo	rkload per semester			160 hours	
Credit points	2					
Requirements prerequisites						
Learning Goals						
Knowledge		Skill		Compete	ence	
Understand some basis	s of •	To outline the prine	cipal •	Able to exp	lain the	
the Petroleum geoscie	nce in	methods of determ	nining	developme	nt of key	
Indonesia		geological time and	d the	concepts in	1	
Understand the reservent	oirs,	development of		geological thinking		
resources, reserves in		geological thinking.		based on some cases		
Indonesia	•	• To enjoy and socialize		presented in the		
characterizing the rese	rvoir	among geoscientists and course				
Explore geological sites	in	social				
Bandung around camp	JS					
Explore cultural and so	cial					
activities of Bandung a	nd					
surrounding						
Content	This 10-da	ays program offers a	a comprehe	nsive introd	luction to the	
	subject of	and basic seismic	and rock of	ny reservoir	nogram will	
	involve se	veral excursions to T	anu Tock pi Tangkuhan P	arahu volca	no Kamojang	
	Geotherm	al field, and Kamoia	ng crates. Cu	Itural and se	ocial activities	
	are includ	ded in the program	n. This prog	ram is sui	table for the	
	undergrad	luate students wh	no have h	ad some	exposure to	
	geoscienc	e				
Study and examination						
requirements and forms of	Midtern	n test	√	40	)%	
examination	Final Te	st		40	)%	
	Present	ation, quizzes,		20	)%	
	homew	ork	۲			
	Laboratory work -					
Media employed	Slides,	beamer, boards,	appropria	ite softw	are, online	
	communic	cation, internet, exer	cises etc.		- 	
Reading list						

### 22. Geomechanics in Geophysics

Module designation	Geomechanics in Geophysics	
Module level	Master	
Code, if applicable	TG5033	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	First Semester / first Year	
module is taught		
Module coordinator(s)	Dr. Wahyu Triyoso, M.Sc.	
Lecturer(s)	Dr. Wahyu Triyoso, M.Sc.; Dr. David Prambudi Sahara, ST. N	<i>Ι</i> Τ.
Language	Bahasa Indonesia	
Relation to curriculum	Elective Subject / Elective Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	$\checkmark$
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class	
	using slide in LCD projector, followed by discussion	$\checkmark$
	session. After presentation, they make report what	
	they present before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	$\checkmark$
	groups. Lecturer checks how they solve the problem in	
	turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	$\checkmark$
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	
	consults problem which they face and discuss together	-
	how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	-
	assistant tell main idea of practical or experimental.	
	They do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to course	-
	material.	

Workload					
WORKIOAU	Class lectures		2 hours		
	Tutorial	session		2 hours	
	Supervision and consultation				
	Practica	l or experimental labo	ratory work		
	Individu	al studies		6 hours	
	Total wo	orkload per week		10 hours	
	Present	ation		4 Hours	
	Class pr	oject		6 hours	
	Field tri	р			
	Total wo	orkload per semester		160 hours	
Credit points	2				
Requirements prerequisites					
Learning Goals					
Knowledge		Skill	Competer	nce	
Inderstanding the inter	rnlav	Able to describe	<ul> <li>Have the abilit</li> </ul>	ty on	
hetween earth stresses		internlay stress	determining a	nd	
pressures, mechanical	oroperties.	and pressure in	analyzing stres	ss and	
and the geometry the a	act upon.	the subsurface.	pressure in the	e	
Understanding the line	ar stress-	<ul> <li>Able to describe</li> </ul>	subsurface	C	
strain relationshin Boc	k failures	rock failure and	<ul> <li>Have ability to</li> </ul>	,	
criterion and fracture	k runures	allures rock failure and • Have ability to			
propagation		nronagation	and fracture	Sex runare	
<ul> <li>Understanding the port</li> </ul>	nrossuro	pressure • Able to describe propagation			
and seismic. Pore pressure		• Able to describe	<ul> <li>Have ability to</li> </ul>	ostimato	
estimation from velocity		and seismic		and	
relations of velocity versus			offoctivo stros		
offective stress	505	ADIE 10     characterize the	coismic data	s using	
Inderstanding wellber	o ctobility	wellbore stability	• Have ability to	modelthe	
<ul> <li>Onderstanding wendor</li> </ul>	e stability.	wendore stability.	• Have ability to	ility	
			wendore stadi	iity.	
Content	1. Introdu	ction: The interplay bet	ween earth stress	es, pressures,	
	mechanica	I properties, and the geo	metry the act upon	; 2. Stress and	
	strain: the	stress tensor, the strai	n tensor, the linear	r stress-strain	
	relationshi	p; 3. Rock failures: in	troduction to rock	experiment,	
	elastic and	plastic material, failure	criterion, fracture p	ropagation; 4.	
	Sediment of	compaction and stress s	tate in the earth: V	/ertical stress,	
	Pore press	ure and sediment com	paction, estimation	of Minimum	
	and Maxim	um horizontal stress; 5.	Pore pressure and	seismic: Pore	
	pressure estimation from velocity relations of velocity versus				
	effective stress: 6. Wellbore stability: Stress change near a horehole				
	compressional and tensile failures on the borehole wall; 7. Geotechnical aspect of rock mechanics: tunnelling, land slide, and underground mining activities. 8. Seismic anisotropy of shales: relation of shale anisotropy to microstructure, clay mineral anisotropy: 9. Student projects: wellbore stability, and seismic data				
				ny of shales	
				clay mineral	
	analysis	, 5. Student projects. We	and stability, diff		
	anarysis				

Study and examination					
requirements and forms of	Midterm test		40%		
examination	Final Test	$\checkmark$	40%		
	Presentation, quizzes,		20%		
	homework	N	20%		
	Laboratory work	-			
Media employed	Slides, beamer, boards, appropriate software, online				
	communication, internet, exercises etc.				
Reading list	1. Sayers, C. M., Geophysics under stress: Geomechanical				
	applications of seismi	c and borehole	e acoustic waves,		
	Society of Exploration Geophysicists, 2010				
	2. Zoback, M., Reservoir Geomechanics, Cambridge University				
	Press, 2007				

# 23. Exploration and Engineering Seismology

Module designation	Exploration and Engineering Seismology	
Module level	Master	
Code, if applicable	TG5113	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	First Semester / first Year	
module is taught		
Module coordinator(s)	Prof.Dr.Ir. Sigit Sukmono, M.Sc.	
Lecturer(s)	Prof.Dr.Ir. Sigit Sukmono, M.Sc.	
Language	Bahasa Indonesia	
Relation to curriculum	Elective Subject / Elective Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	$\checkmark$
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class using	
	slide in LCD projector, followed by discussion session.	
	After presentation, they make report what they present	
	before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	-
	groups Lecturer checks how they solve the problem in	
	turns	
	Class project and discussion	
	Last project and discussion	
	surrent issues and source material	-
	This activity is continuation of class project. Students	-
	consults problem which they face and discuss together	
	how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	-
	assistant tell main idea of practical or experimental.	
	They do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to course	-
	material.	

Class lectures	2 hours
Tutorial session	2 hours
Supervision and consultation	-
Practical or experimental laboratory work	-
Individual studies	6 hours
Total workload per week	10 hours
Presentation	-
Class project	-
Field trip	-
Total workload per semester	160 hours
	Class lectures Tutorial session Supervision and consultation Practical or experimental laboratory work Individual studies Total workload per week Presentation Class project Field trip Total workload per semester

Knowledge		Skill	Competence
	<ul> <li>Knowledge about the application of reflection seismic methods in oil argas exploration specifically evaluation of leads and prospects</li> <li>Knowledge of evaluation and development of or and gas fields.</li> </ul>	<ul> <li>e Understand the acquisition technology survey design, processing and interpretation or seismic reflection data</li> <li>Interpret the sequence analysis and seismic facies, depositiona environmental analysis system tract analysis)</li> </ul>	<ul> <li>e Understand some useful data processing methods and associated linear algebra which are transferable to other fields/applications.</li> <li>Understand the concept of value of information.</li> <li>Able to present orally and professionally all of the above topics at research level.</li> </ul>
Content This course provides knowledge about the application of reflect seismic methods in oil and gas exploration specifically evaluation leads and prospects as well as evaluation and development of and gas fields. In this course we discuss acquisition technolo survey design, processing and interpretation of seismic reflect data (sequence analysis and seismic facies, deposition environmental analysis, system tract analysis), and mode (seismic inversion) in the form of integrated studies. This lectur project based. Each project has a specific objective in accordat with the stages of oil and gas exploration.			about the application of reflection evoluation specifically evaluation of evaluation and development of oil ve discuss acquisition technology, nterpretation of seismic reflection d seismic facies, depositional n tract analysis), and modeling f integrated studies. This lecture is a specific objective in accordance ploration.
St	udy and examination		1 10 %
TE P	equirements and forms of camination	Final Tast	<u>v 40 %</u>
C		Procentation guizzos	V 40 %
		homework	√ 20 %
		Laboratory work	-

Media employed	Slides, beamer, boards, appropriate software, online		
	communication, internet, exercises etc.		
Reading list	1.	Sukmono, S.,, Diktat Kuliah Interpretasi Seismik Refleksi, , ITB,	
		2010	
	2.	Yilmaz, O, Seismic Data Processing, Society of Exploration	
		Geophysics, , , 1987	
	3.	Sheriff, R.E. & Geldart, L.P, Exploration Seismology, , , 1987	
	4.	Sukmono, S, Post and Prestack Seismik Inversion for	
	Hydrocarbon Reservoir Characterization, , ITE		
	5.	Russel, B.M, Introduction to Seismic Inversion Method, , SEG,	
	6.	Sukmono, S, Fundamentals of Seismic Sequence Stratigraphy	
	in Field Exploration & Developmeny, , ITB, 2011		
	7.	Payton, CE (ed),, Seismic Stratigraphy, , , 1977	
8. Brown, A.R, Interpretation of 3-Dimensional		Brown, A.R, Interpretation of 3-Dimensional Seismic Data, , ,	
		2009	

# 24. Hidrogeophysics

Module designation	Hidrogeophysics	
Module level	Master	
Code, if applicable	TG5133	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	First Semester / first Year	
module is taught		
Module coordinator(s)	Dr.Ir. Agus Laesanpura, MS	
Lecturer(s)	Dr.Ir. Agus Laesanpura, MS	
Language	Bahasa Indonesia	
Relation to curriculum	Elective Subject / Elective Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class using	
	slide in LCD projector, followed by discussion session.	$\checkmark$
	After presentation, they make report what they present	
	before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	-
	groups. Lecturer checks how they solve the problem in	
	turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	-
	Current issues and consultation	
	This activity is continuation of class project. Students	
	consults problem which they face and discuss together	-
	how to solve the problem	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	-
	assistant tell main idea of practical or experimental	
	They do the practical afterwards	
	Field trip	
	Visit field area or company which is related to course	-
	material.	

Workload			
	Class lectures	Class lectures	
	Tutorial session		2 hours
	Supervision and consultation		-
	Practical or experimental labora	tory work	-
	Individual studies		6 hours
	Total workload per week		10 hours
	Presentation		-
	Class project		-
	Field trip		-
	Total workload per semester		160 hours
Credit noints	2		
Requirements prerequisites			
Learning Goals			
Knowledge	Skill	Competence	
Understand water	Able to decoding fluide	Able to sove so	ome
habitats in nature and	with selected	hydrogeophyti	ic cases
their experience throug	gh geophysical methods.	presented in t	he class
simulations.	Able to determinate		
<ul> <li>Understand the</li> </ul>	parameterization in 1-D,		
hydrological cycle, and	2-D modeling		
its aspects.			
Understand flow			
modeling and			
parameterization			
Contont			
Content	Fluide in natural setting and engin	ereed processes, na	ive changed,
	additionally with domestic activity the problem becomes		
	to knowledge and technique on w	ater balance, detect	ting fluide
	and medium property with geoph	vsical methods, para	amerization
	model, simulation, and finally intr	oducing to several c	ase study
Study and examination			
requirements and forms of	Midterm test	√ 40	%
examination	Final Test	√ 40	%
	Presentation, quizzes,	20	%
	homework	v	
	Laboratory work		
Media employed Slides, beamer, boards, appropriate software, online			
	communication, internet, exercises etc.		
Reading list	1. Environmental Geophysic	s, Vogelslang	
2. Solute Transport Modelling, Rausch, Wagner			
3. Applied Hidrogeology, Fetter			
	<ol> <li>Hidrogeophysics, Yoram e</li> </ol>	et.al VSDI, USGS	
# 25. Geophysical Modeling and Tomography

Module designation	Geophysical Modeling and Tomography	
Module level	Master	
Code, if applicable	TG5134	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	First Semester / first Year	
module is taught		
Module coordinator(s)	Dr.Eng.Ir. T.A. Sanny, MT	
Lecturer(s)	Dr.Eng.Ir. T.A. Sanny, MT , Prof.Dr. Andri Dian Nugraha S.Si	. <i>,</i> M.Si.
Language	Bahasa Indonesia	
Relation to curriculum	Elective Subject / Elective Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	
	presents course material using media such as slide in	
	ICD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class using	
	slide in LCD projector followed by discussion session	2
	After procentation, they make report what they procent	N
	hefere	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	
	groups. Lecturer checks how they solve the problem in	
	turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	-
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	
	consults problem which they face and discuss together	-
	how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly Jaboratory	_
	assistant tell main idea of practical or experimental	
	They do the practical afterwards	
	Field trip	
	visit field area or company which is related to course	-

Workload		
Workload	Class lectures	2 hours
	Tutorial session	-
	Supervision and consultation	-
	Practical or experimental laboratory work	-
	Individual studies	7 hours
	Total workload per week	9 hours
	Presentation	16 hours
	Class project	-
	Field trip	-
	Total workload per semester	160 hours
Credit points	2	
Requirements prerequisites		

#### Learning Goals

	-				
	Knowledge	Skill	Competence		
	Understand the concep	• Able to create progra	am • Poss	esses in	basic
	and processing step	of code of ray tracing from	om conc	epts of	seismic
	geotomography imagi	g source to receiver	geot	omography	
	technology	Able to determin	ne tech	nology	
	• Understand the state	of mathematical equation	of Fami	iliar in	data
	the art of the	e delay time tomography	acqu	isition	of
	geotomograhpy imagi	g • Able to solve matr	rix geot	omography	
	Linderstand recolution	equation of delay tim	ne Abie	to im	plement
	Understand resolution     test of tomograph	n tomography	no the s	ubsurface.co	Indging
	inversion	• Fairiniar III delay till			nution
	Understand application	of Eamiliar in resolution te	oct		
	geotomography	of tomographic inversion	on		
		Familiar in application of	of		
		geotomography			
Сс	ontent	The topics subject are focused	l into the foll	owing subto	pics: recent
		development of tomography an	nd its applica	tion of subsu	rface image
		reconstruction on multi-scale	e problem,	data acquis	ition, step
		reconstruction of image, pa	arameterizat	ion model,	raytracing
		methodology, determining	matrix of	seismic to	mography,
		interpretation. This lecture on	ing application	on, resolutio	n test and
		tomography in earth science	ipnasizes the	recent deve	iopment of
		tomography in earth science			
St	udy and examination		1		1
re	quirements and forms of	Midterm test	N	40 %	
ex	amination	Final Test		40 %	
		Presentation, quizzes,		20 %	
		homework			
		Laboratory work	-	-	

Media employed	Slides, beamer, boards, appropriate software, online		
	communication, internet, exercises etc.		
Reading list	1. Nugraha, A. D. (2017). Tomografi Seismik, Penerbit ITB Press, ISBN 978-602-5417-48-1.		
	<ol> <li>Zhao, D. (2019). Multiscale Seismic Tomography, Springer Geophysics, ISBN 978-4-431-55359-5.</li> </ol>		
	3. Iyer H.M. and Hirahara, K. (Ed.), 1993. Seismic Tomography: Theory and Practice. Chapman & Hall, London.		
	<ol> <li>Nolet, G. (Ed.), 1987. Seismic Tomography with applications in global seismology and exploration geophysics. D. Reidel Publishing Company, Dordrecht.</li> </ol>		
	5. Press, W.H. et al., 1992, Numerical Recipes, Cambridge University Press, Cambridge.		
	<ol> <li>Sanny, T. A., 2000, Geotomografi (diktat Kuliah), Jurusan Teknik Geofisika ITB.</li> </ol>		

# 26. Individual Project in Geophysics

Module designation	Individual Project in Geophysics	
Module level	Master	
Code, if applicable	TG5025	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	First Semester / first Year	
module is taught		
Module coordinator(s)	Dr. rer. nat. R. Mohammad Rachmat Sule, S.T, M.T.	
Lecturer(s)	Dr. rer. nat. R. Mohammad Rachmat Sule, S.T, M.T.	
Language	Bahasa Indonesia	
Relation to curriculum	Elective Subject / Elective Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	guizzes, task, or homework in some classes. Lecturer	$\checkmark$
	presents course material using media such as slide in	·
	ICD projector and whiteboard	
	Presentation	
	Students present course materials in front of class using	
	students present course materials in none of class using	1
	side in LCD projector, followed by discussion session.	N
	After presentation, they make report what they present	
	before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	
	groups. Lecturer checks how they solve the problem in	
	turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	$\checkmark$
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	,
	consults problem which they face and discuss together	$\checkmark$
	how to solve the problem	
	Practical or experimental laboratory work	
	Studente de gractical en europine entel in the laboratory	
	Students do practical or experimental in the laboratory	,
	according to practical module. Firstly, laboratory	N
	assistant tell main idea of practical or experimental.	
	They do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to course	-
	material.	

Workload			
	Class lectures		1 hours
	Tutorial session		2 hours
	Supervision and consultation		2 hours
	Practical or experimental labo	oratory work	2 hours
	Individual studies		2 hours
	Total workload per week		9 hours
	Presentation		3 hours
	Class project		4 hours
	Field trip		
	Total workload per semester		160 hours
Credit points	2		
Requirements prerequisites			
Learning Goals			
Knowledge	Skill	Competence	
Understand the	Able to identify the real	Able to	developing
concept and purposes	geoscience problem in	geophysical i	nstrument,
of geophysical	related with geophysical	developing g	geophysical
methods	methods learned from	software, g	geophysical
Understand the basic	the courses	measurement,	applying
knowledge of	• Able to implement the	geophysical me	ethods as
geological and	geophysical method for	solution to pr	oblem or
geophysical concepts	solving the geoscience	other forms ap	proved by
in solving the real	problem approved by	the supervisor	
problems	the supervisor	Able to rep	ort and
		presenting the pr	oject
			-
Content	In a group of 3-4, students car	ry out a particular proj	ect related to
	geophysics with a clear and me	asurable output under s	supervision of
	a particular faculty member. I	trumont doveloping	
	software geophysical measure	ment applying geophy	sical methods
	as solution to problem or othe	or forms approved by the	
	Apart from reporting the project	ct in writing, the studen	ts should also
	present the instruments, softw	are, data, or other evid	ences in open
	presentation attended by supe	rvisor and examiner.	
Study and examination			
requirements and forms of	Midterm test	√ 40	%
examination	Final Test	√ 40	%
	Presentation, quizzes,	20	%
	homework	N .	
	Laboratory work		
iviedia employed	Sildes, beamer, boards, approp	riate software, online	
Roading list	Pased on Project tonics		
neduling list	based on Project topics		

## 27. Microseismic

Module designation	Microseismic	
Module level	Master	
Code, if applicable	TG5149	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	First Semester / first Year	
module is taught		
Module coordinator(s)		
Lecturer(s)	Prof.Dr. Andri Dian Nugraha S.Si., M.Si, Dr. rer. nat. David P	rambudi
	Sahara, ST,MT	
Language	Bahasa Indonesia	
Relation to curriculum	Elective Subject / Elective Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	$\checkmark$
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class	
	using slide in LCD projector, followed by discussion	$\checkmark$
	session. After presentation, they make report what	
	they present before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	-
	groups. Lecturer checks how they solve the problem in	
	turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	-
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	1
	consults problem which they face and discuss together	$\checkmark$
	how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	-
	assistant tell main idea of practical or experimental.	
	They do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to course	-
	material.	

Workload	Class lectures			2 hour	s
	Tutorial session		-		
	Supervision and consultation	Supervision and consultation		2 hour	S
	Practical or experimental lat	poratory work	<	-	
	Individual studies			6 hour	S
	Total workload per week			10 houi	ſS
	Presentation			4 hour	s
	Class project			6 hour	s
	Field trip			-	
	Total workload per semeste	r		160 hou	rs
Credit points	2				
Requirements prerequisites					
Learning Goals					
Knowledge	Skill		Competenc	e	
Understanding the	• Able to determin	ne • Posse	ss an	extensiv	e
concept of the	microseismic location, source	ce know	ledge of mi	croseismi	с
microseismic	mechcnism of microseismi	c, activi	ty as a fu	inction o	f
monitoring in	introduction of shear way	/e fluids	injection	in variou	s
geothermal field, oil	splitting and utilization	of field	as well	as the	e
and gas field, and	microseismic data	in integr	ation wit	th othe	r
	geophysics	geosc	lience		
	monitoring in geothermal fie including basic concept of microseismic event (analysis determining microseismic microseismic, introduction of microseismic data in geophysic mitigation.	Id, oil and g of microseis s of microse location, so shear wave sp cs exploratior	as field, ar mic, ident eismic wav ource me plitting and n and earthe	id local f tification re phase chcnism utilizatio quake haz	ault of s), of n of zard
Study and examination	Midterm test		359	6	
requirements and forms of	Final Test	V V	35%	6	
examination	Presentation, guizzes.				
	homework		30%	6	
	Laboratory work	-	-		
Media employed	Slides, beamer, boards, approv	priate softwa	re. online		
	communication, internet, exer	rcises etc.			
Reading list	1. Shapiro, S.A, Microseis	smicity, , EAG	E Publicatio	ons, 2008	
_	2. Ottemoller, L., Havsko	v, J, Routine I	Data Proces	sing in	
	Earthquake Seismology, . Springer. 2010				
	3. Huenges, E, Geothermal Energy Systems: Exploration,				
	Development, and Utilization, , WILEY-VCH Verlag GmbH &				
	Co. KgaA, 2010				
	4. Sharer, P.M., Introduction to Seismology, , Cambridge				
	University Press, 2009				
	5. Lay, T., Wallace, T. C, Modern Global Seismology, ,				
	5. Lay, T., Wallace, T. C, I	Modern Globa	al Seismolog	gy,,	

### 28. Advanced Geostatistics

Module designation	Advanced Geostatistics	
Module level	Master	
Code, if applicable	TG5213	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	Second Semester / first Year	
module is taught		
Module coordinator(s)	Dr. Darharta Dahrin, MS	
Lecturer(s)	Dr. Darharta Dahrin, MS, Dr. Susanti Alawiyah, ST,MT	
Language	Bahasa Indonesia	
Relation to curriculum		
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	$\checkmark$
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class	
	using slide in LCD projector, followed by discussion	$\checkmark$
	session. After presentation, they make report what	
	they present before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	$\checkmark$
	groups. Lecturer checks how they solve the problem in	
	turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	$\checkmark$
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	2
	consults problem which they face and discuss together	v
	how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	-
	assistant tell main idea of practical or experimental.	
	They do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to course	-
	material.	

Workload	Class lectures	2 hours	
	Tutorial session	1 hour	
	Supervision and consultation	1 hour	
	Practical or experimental laboratory work		
	Individual studies	6 hours	
	Total workload per week	10 hours	
	Presentation	4 hours	
	Class project	6 hours	
	Field trip		
	Total workload per semester	160 hours	
Credit points	2		
Requirements prerequisite	5		
Learning Goals			
Knowledge	Skill Competence		
Students are able	<ul> <li>Students are able to</li> <li>The student have the operation</li> </ul>	capabilities	
to explain the the	analyze the data and to design a projects, to p	process the	
application of	use the geostatistical data, and to find the opti	imal model	
geostatistics in	methods to obtain the and interpretation b	based on	
geophysics	desired results. geostatistical methods.		
	Introduction, Uni variable data analysis, Spatial correlation, Estimation and modleing, Kriging Estimation, Linear Kriging, Non Linear Kriging, Application, Conditional Simulation Technique, Grid Based Simulation, Object based simulation, Simulation Technique Based on Facies Geology, Geostatistics Invertion, Application.		
Study and examination	n Midtorm tort 20	0/	
requirements and forms	of Final Test V 350	%	
examination	Presentation quizzes	/0	
	homework $\sqrt{359}$	%	
	Laboratory work -		
Media employed	communication, internet, exercises etc.	are, online	
Reading list	1. Christakos. G., Random Field Models in Ea	rth Sciences.	
	Academic Press. Inc., 1992.	· · · · · · · · · · · · · · · · · · ·	
	2. Kelkar, M. And Perez, G., 2002, applied Geo	ostatistics for	
	Reservoir Characterization, SPE Inc. Richardson.	Texas.	
	3. Dubrul. O., Geostatistics for seismic Data Integr	ation in Earth	
	Models SEG 2003		
	A David M I C Geostatistical Ore Reserve Estimation Elsevier		
	Scientific Publishing Company, 1986.		
	5. Davis, J. C., Statistics and Data Analysis in Geology, John Wiley		
	and Sons 2nd ed. 1986		
	6. Journel, A. G., and Ch. J. Huilbregts, Mining Geostatistics		
	Academic Press 1978		
	7. Geophysics, SEG Journal		

## 29. Disaster Mitigation

Module designation	Disaster Mitigation	
Module level	Master	
Code, if applicable	TG5232	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	Second Semester / first Year	
module is taught		
Module coordinator(s)	Prof.Dr. Antonius Nanang Tyasbudi P. M.Sc.	
Lecturer(s)	Prof.Dr. Antonius Nanang Tyasbudi P. M.Sc.	
Language	Bahasa Indonesia	
Relation to curriculum	Elective Subject / Elective Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	$\checkmark$
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class	
	using slide in LCD projector, followed by discussion	
	session. After presentation, they make report what	,
	they present before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	
	groups Lecturer checks how they solve the problem in	
	turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	$\checkmark$
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	,
	consults problem which they face and discuss together	$\checkmark$
	how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, Jaboratory	_
	assistant tell main idea of practical or experimental	
	They do the practical afterwards	
	Field trin	
	Visit field area or company which is related to course	
	material	-

Workload			
	Class lectures		2 hours
	Tutorial session		-
	Supervision and consultation	ו	2 hours
	Practical or experimental lab	oratory work	-
	Individual studies	·	6 hours
	Total workload per week		10 hours
	Presentation		4 hours
	Class project		6 hours
	Field trip		-
	Total workload per semester		160 hours
Credit points	2		
Requirements prerequisites	2		
Requirements prerequisites			
Learning Goals			
Knowledge	Skill	Competer	ice
Understanding the bas	ic • Able to classify the	Possess an ext	tensive
concept of geological	natural disaster and its	knowledge an	d ability to
hazard, disaster	spatial distribution,	solve problem	is related
mitigation, and disaste	r especially in Indonesia	to disaster mi	tigation
management.	Able to solve problem		0
C	related to disaster		
	mitigation		
Content	Classification of natural disaster and its spatial distribution; basic		
concept of disaster management; key elements in the disaster		e disaster	
	management; basic concept of	disaster mitigation an	d its key
	elements; disaster managemer	nt act in Indonesia; stat	te of the art
	disaster mitigation in Indonesia; earthquake hazard mitigation;		
	tsunami hazard mitigation; landslide hazard mitigation; volcanic		
	hazard mitigation; liquefaction	mitigation.	
Study and examination			
requirements and forms of	Midterm test	√ 35	%
examination	Final Test	$\sqrt{\frac{1}{\sqrt{25}}}$	%
	Presentation guizzes	, 33	. ,0
	homework	√ 30	%
			_
Media employed	Slides, boards, appropriate sof	tware, online commun	ication,
	internet, exercises etc.		
Reading list	1. Bryant, E., Natural Haz	ards, second edition, C	ambridge
	University Press, 2005		
	2. Carter, W.N., Disaster	Management: A Disast	er Manager's
	Handbook, Asian Deve	lopment Bank, Manila,	2008
	3. Smith, K. and Petley, D	. N., Environmental Ha	zards:
Assessing risk and reducing disaster, fifth edition,		tion,	
	Routledge, 2009		

# **30.** Exploration Geophysics for Oil and Gas

Module designation	Exploration Geophysics for oil and gas	
Module level	Master	
Code, if applicable	TG5235	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	Second Semester / first Year	
module is taught		
Module coordinator(s)	Dr. rer. nat. R. Mohammad Rachmat Sule, S.T, M.T.	
Lecturer(s)	Dr. rer. nat. R. Mohammad Rachmat Sule, S.T, M.T.	
Language	Bahasa Indonesia	
Relation to curriculum	Elective Subject / Elective Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes task or homework in some classes. Lecturer	
	presents course material using media such as slide in	•
	LCD projector and whiteheard	
	Decentation	
	Presentation	
	Students present course materials in front of class using	
	slide in LCD projector, followed by discussion session.	-
	After presentation, they make report what they present	
	before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	-
	groups. Lecturer checks how they solve the problem in	
	turns	
	Class project and discussion	
	Lecturer gives students a project which related to	_
	current issues and course material	
	Supervision and consultation	
	This activity is continuation of class project. Students	-
	consults problem which they face and discuss together	
	how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	-
	assistant tell main idea of practical or experimental.	
	They do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to course	_
	material	

	Class	lacturas			2 hours	
					2 nours	>
	- Tuto	ridi session			-	
	Brad	isal or experimental lab	I oratory	work	-	
	Fidu	idual studios	Joratory	WUIK	- 9 hour	
	Tata				8 1001S	>
	Tota				10 hour	S
	Prese	entation			-	
	Class	project			-	
	Field	trip				
	Tota	workload per semester	r		160 hou	rs
Credit points	2					
Requirements prerequisites						
Learning Goals	1					
Knowledge		Skill		Competence		
	ntary	• Able to evaluit	tha		+6.	$\exists$
process in basin	ritdly	• Able to explain	i the	<ul> <li>PUSSESS</li> <li>compotence</li> </ul>	LNE A to evolui	
Inderstanding	hacin	• Able to evolution re	sonuoir	the	reservoi	r
distribution and	thoir	• Able to explain re	servoir	characteriz	ation using	י ד
geological characterizat	ion in	geological con	ditions	seismic dat	a.	>
Indonesia region.		structure, stratigrap	hy and	<ul> <li>Possess the</li> </ul>	e capability	,
Understanding oil and	1 gas	gas status of their activity. of interpreting		7		
exploration activities using • Ah		Able to interpret	seismic	geophysica	l data in oi	, 
geological, and geoph	vsical	data for reserve all	ocation	and gas ind	ustry.	-
methods.	,	and calculation.		0	,	
-		ourse explains all geoph	ivsical m	ethods used in t	اممدم المحماط	~ ~ ~
Content			.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		the oil and	gas
Content	explor	ation, except reflectio	n seismi	c method. In t	the beginn	ing,
Content	explor explor	ation, except reflectio	n seismi importa	c method. In t ance of geophy	the beginn sical meth	gas ing, ods
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Content	explor explor integr acquis	ration, except reflectio ration concept and the ration will be given. E ration, data processing a	n seismi importa Explainat and data	c method. In t ance of geophy ion about the interpretation	the beginn sical meth theory, d will be tau	ing, ods lata ght
Content	explor explor integr acquis for ea	ration, except reflectio ration concept and the ration will be given. E ration, data processing a ration method. Several case the inportance and	n seismi importa Explainat and data ase stud	c method. In t ance of geophy ion about the interpretation ies will be give	the beginn rsical meth theory, d will be tau en in order	gas ing, ods lata ght to
Content	explor explor integr acquis for ea increa	ration, except reflectio ration concept and the ation will be given. E ition, data processing a ich method. Several ca se the inportance and u	n seismi importa Explainat and data ase stud understa	c method. In t ance of geophy ion about the interpretation ies will be give nding of each n	the beginn sical meth theory, d will be tau en in order nethod. At	gas ing, ods lata ght to the
Content Study and examination	explor explor integr acquis for ea increa end of	ation, except reflectio ration concept and the ation will be given. E ition, data processing a ich method. Several ca se the inportance and u the course, each stude	n seismi importa Explainat and data ase stud understa ent is exp	c method. In t ance of geophy ion about the interpretation ies will be give nding of each n ected to give a	the beginn rsical meth theory, d will be tau en in order nethod. At presentatio	gas ing, ods lata ght to the on.
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Content Study and examination requirements and forms of examination	explor explor integr acquis for ea increa end of Midt Final	ration, except reflectio ration concept and the ation will be given. E ition, data processing a ich method. Several ca se the inportance and u the course, each stude erm test Test	n seismi importa Explainat and data ase stud understa <u>ent is exp</u> 	c method. In t ance of geophy ion about the interpretation ies will be give nding of each n ected to give a 40 40	the beginn sical meth theory, d will be tau en in order nethod. At presentation	gas ing, ods lata ght to the on.
Content Study and examination requirements and forms of examination	explor explor integr acquis for ea increa end of Midt Final	ration, except reflectio ration concept and the ation will be given. E ition, data processing a ich method. Several ca se the inportance and u f the course, each stude erm test Test entation, quizzes,	n seismi importa Explainat and data ase stud understa <u>ent is exp</u>  	c method. In t ance of geophy ion about the interpretation ies will be give nding of each n ected to give a 40 40 20	the off and the beginn rsical meth theory, d will be tau en in order nethod. At presentation	gas ing, ods lata ght the on.
Content Study and examination requirements and forms of examination	explor explor integr acquis for ea increa end of Midt Final Prese	ration, except reflection ration concept and the ation will be given. E ition, data processing a sect method. Several ca se the inportance and u the course, each stude erm test Test entation, quizzes, ework	n seismi importa Explainat and data ase stud understa ant is exp  	c method. In t ance of geophy ion about the interpretation ies will be give nding of each n ected to give a 40 40 20	the off and the beginn rsical meth theory, d will be tau en in order nethod. At presentation %	gas ing, ods lata ght to the on.
Content Study and examination requirements and forms of examination	explor explor integr acquis for ea increa end of Midt Final Prese home	ration, except reflection ration, except reflection ration concept and the ation will be given. E wition, data processing a set he inportance and u f the course, each stude erm test Test entation, quizzes, ework ratory work	n seismi importa Explainat and data ase stud understa <u>ent is exp</u>   	c method. In t ance of geophy ion about the interpretation ies will be give nding of each n ected to give a 40 40 20	the off and the beginn rsical meth theory, d will be tau en in order nethod. At presentation %	gas ing, ods lata ght to the on.
Content Study and examination requirements and forms of examination Media employed	explor explor integr acquis for ea increa end of Midt Final Prese hom Labo	ation, except reflectio ration concept and the ation will be given. E ition, data processing a ich method. Several ca se the inportance and u the course, each stude erm test Test entation, quizzes, ework ratory work beamer, boards,	n seismi importa Explainat and data ase stud understa ant is exp     	c method. In t ance of geophy ion about the interpretation ies will be give nding of each n ected to give a 40 40 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	the off and the beginn rsical meth theory, d will be tau en in order nethod. At presentation %	gas ing, ods lata ght to the on.
Content Study and examination requirements and forms of examination Media employed	explor explor integr acquis for ea increa end of Midt Final Prese home Labo	ration, except reflection ration, except reflection ration concept and the ation will be given. E ition, data processing a sech method. Several ca se the inportance and u the course, each stude erm test Test rest entation, quizzes, ework ratory work beamer, boards, unication, internet, exe	n seismi importa Explainat and data ase stud understa <u>ent is exp</u>       ercises et	c method. In t ance of geophy ion about the interpretation ies will be give nding of each n ected to give a 40 40 20 0 0priate softw c.	the off and the beginn rsical meth theory, d will be tau en in order nethod. At presentation %	gas ing, ods lata ght the on.
Content Study and examination requirements and forms of examination Media employed Reading list	explor explor integr acquis for ea increa end of Midt Final Prese hom Labo Slides, comm	ration, except reflection ration, except reflection ration concept and the ation will be given. E ition, data processing a set the inportance and u f the course, each stude erm test Test entation, quizzes, ework ratory work beamer, boards, unication, internet, exe rant & West, Interpretat	n seismi importa Explainat and data ase stud understa nt is exp      appr ercises et tion Theo	c method. In t ance of geophy ion about the interpretation ies will be give nding of each n ected to give a 40 40 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	the off and the beginn rsical meth theory, d will be tau en in order nethod. At presentation % % % % % % % % % % % % % % % % % % %	gas ing, ods lata ght to the on.
Content Study and examination requirements and forms of examination Media employed Reading list	Inis co explor explor integr acquis for ea increa end of Midt Final Prese home Labo Slides, comm 1. Gi	ration, except reflectio ration concept and the ation will be given. E ition, data processing a sethe inportance and u the course, each stude erm test Test entation, quizzes, ework ratory work beamer, boards, unication, internet, exe rant & West, Interpretat raw-Hill Book Company.	n seismi importa Explainat and data ase stud understa ant is exp      ercises et tion Theo , 1965.	c method. In t ance of geophy ion about the interpretation ies will be give nding of each n ected to give a 40 40 20 opriate softw c. ory in Applied Ge	the off and the beginn rsical meth theory, d will be tau en in order nethod. At presentation % % % % % ware, on eophysics, f	gas ing, ods lata ght the on.
Content Study and examination requirements and forms of examination Media employed Reading list	Inis co explor explor integr acquis for ea increa end of Midt Final Prese home Labo Slides, comm 1. Gr Gi 2. Te	ration, except reflectio ration, except reflectio ration concept and the ation will be given. E ition, data processing a sch method. Several ca se the inportance and u the course, each stude erm test Test entation, quizzes, ework ratory work beamer, boards, unication, internet, exe rant & West, Interpretat raw-Hill Book Company, elford et al., Applied Geo	n seismi importa Explainat and data ase stud understa ent is exp     ercises et tion Theo , 1965. ophysics	c method. In t ance of geophy ion about the interpretation ies will be give nding of each n ected to give a 40 40 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	the off and the beginn rsical meth theory, d will be tau en in order nethod. At presentation % % % % % % % % % % % % % % % % % % %	gas ing, ods lata ght the on. line Mc.
Content Study and examination requirements and forms of examination Media employed Reading list	explor explor integr acquis for ea increa end of Midt Final Prese hom Labo Slides, comm 1. Gi 2. Te 3. Re	ration, except reflection ration, except reflection ration concept and the ation will be given. E ition, data processing a set the inportance and u the course, each stude erm test Test entation, quizzes, ework ratory work beamer, boards, unication, internet, exe rant & West, Interpretat raw-Hill Book Company, elford et al., Applied Geo eynolds, J.M., An Introd	n seismi importa Explainat and data ase stud understa nt is exp       expr rcises et tion Theo , 1965. ophysics duction t	c method. In t ance of geophy ion about the interpretation ies will be give nding of each n ected to give a 40 40 20 opriate softw c. ory in Applied Ge	the off and the beginn rsical meth theory, d will be tau en in order nethod. At presentation % % % % % % % % % % % % % % % % % % %	gas ing, ods lata ght to the on. line Mc.
Content Study and examination requirements and forms of examination Media employed Reading list	Inis co explor explor integr acquis for ea increa end of Midt Final Prese home Labo Slides, comm 1. Gi 3. Re G	ration, except reflectio ration, except reflectio ration concept and the ation will be given. E ition, data processing a sethe inportance and u the course, each stude erm test Test entation, quizzes, ework ratory work beamer, boards, unication, internet, exe rant & West, Interpretat raw-Hill Book Company, elford et al., Applied Geo eynolds, J.M., An Introc eophysics. John Wiley a	n seismi importa Explainat and data ase stud understa ant is exp       ercises et tion Theo , 1965. ophysics duction t nd Sons,	c method. In t ance of geophy ion about the interpretation ies will be give nding of each n ected to give a 40 40 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	the off and the beginn rsical meth theory, d will be tau en in order nethod. At presentation % % % % % % % % % % % % % % % % % % %	gas ing, ods lata ght to the on. line Mc. 976 ntal
Content Study and examination requirements and forms of examination Media employed Reading list	Inis co explor explor integr acquis for ea increa end of Midt Final Prese home Labo Slides, comm 1. Gi 3. Re 3. Re 4. Sh	ration, except reflectio ration, except reflectio ration concept and the ation will be given. E ition, data processing a sch method. Several ca se the inportance and u the course, each stude erm test Test entation, quizzes, ework ratory work beamer, boards, unication, internet, exe rant & West, Interpretat raw-Hill Book Company, elford et al., Applied Geo eynolds, J.M., An Introc eophysics. John Wiley a heriff, R.E., dan L.P.	n seismi importa Explainat and data ase stud understa ant is exp       ercises et tion Theo , 1965. ophysics duction t nd Sons, Gelda	c method. In t ance of geophy ion about the interpretation ies will be give nding of each m ected to give a 40 40 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	the off and the beginn rsical meth theory, d will be tau en in order nethod. At presentation % % % % % % % % % % % % % % % % % % %	gas ing, ods lata ght the on. line Mc. 976 ntal

## 31. Marine Geophysics

Module designation	Marine Geophysics	
Module level	Master	
Code, if applicable	TG6141	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	Third Semester / second Year	
module is taught		
Module coordinator(s)	Dr. Darharta Dahrin, MS	
Lecturer(s)	Dr. Darharta Dahrin, MS; Dr. Alfian, MT	
Language	Bahasa Indonesia	
Relation to curriculum	Elective Subject / Elective Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes task or homework in some classes. Lecturer	
	presents course material using media such as slide in	,
	LCD projector and whitehoard	
	Presentation	
	Students present course materials in front of class using	,
	slide in LCD projector, followed by discussion session.	$\checkmark$
	After presentation, they make report what they present	
	before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	
	groups. Lecturer checks how they solve the problem in	
	turns	
	Class project and discussion	
	Lecturer gives students a project which related to	2
	surrent issues and source material	v
	Supervision and consultation	
	This activity is continuation of class project. Students	
	consults problem which they face and discuss together	
	how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	-
	assistant tell main idea of practical or experimental.	
	They do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to course	
	material	-

Workload		
	Class lectures	2 hours
	Tutorial session	1 hours
	Supervision and consultation	1 hours
	Practical or experimental laboratory work	-
	Individual studies	6 hours
	Total workload per week	10 hours
	Presentation	4 hours
	Class project	16 hours
	Field trip	-
	Total workload per semester	160 hours
Credit points	2	
Requirements prerequisites		

#### Learning Goals

Knowledge	Skill	Competence
<ul> <li>Understand the overview and application of marine geophysics</li> <li>Understand the application of marine geophysics in hydrocarbon and mining exploration, geodynamics</li> <li>Students are able to explain the marine dat geophysics used in geodynamics and the application of marine geophysics for natural resources in the offshore area.</li> </ul>	<ul> <li>Apply various geophysical methods, e.g. gravity, magnetic, electromagnetic, for analyzing geological features in marine area</li> <li>Students are able to explain the marine data geophysics used in geodynamics and the application of marine geophysics for natural resources in the offshore area.</li> </ul>	<ul> <li>The student have the capabilities to design a projects, to process the marine data, and to find the optimal model and interpretation based on marine geophysics methods.</li> </ul>
Content	Introduction, Hydrocarbon and mi geological researches for geodyn System using electromagnetic was cases studies, Geomagnetic and c sea floor spreading,Seismology reflexion and refraction for	ning Exploration, Geophysical and amics and Tectonics, Navigation ve, Acoustic and GPS. Gravity and ases studies, Paleomagnetics and for lithosphere studies, seismic hydrocarbon exploration and

geodynamics studies, Heat Flow for volcanoc and tectonics studies,

Geoelectric, and Electromagnetics for lithosphere studies.

Study and examination			
requirements and forms of	Midterm test		
examination	Final Test		ogual
	Presentation, quizzes,		equal
	homework	N	
	Laboratory work	-	-
Media employed	Slides beamer boards appr	opriate softwa	re online
	communication. internet. ex	ercises etc.	re, onnie
Reading list	1. Fowler, C.M.R. , 199	0, The Solid Ear	rth. Cambridge
	University Press.		c
	2. Jones, E. J. , 1999, M	arine Geophys	ics, John Wiley & Sons.
	3. Kearey, P. &F.J. Vine	., 1990, Global	Tectonics. Blackwell
	Scientific Publ.		
	4. Richards, M.A., Gord	lon, R.G., and v	an der Hilst, R.D., The
	history and Dynamic	s of Global Plat	te Motion, AGU,
	Washington, DC, 200	00.	
	5. Turcotte, D.L. , 1982	, Geodynamics	Application of
	continuum Physics to	o geological Pro	oblems, John Wiley &
	Sons		and Caslery
	6. LIDOUITIY, L., 1999, C	Quantitative Ge	eophysics and Geology,
	7 Eu L and Cazenave		timetry and Earth
	sciences Academic I	, A., Satellite al Pross 2001	timetry and Larth
	8 Journal of Geophysic	al Research	
	9. Geophysics, SEG Jou	rnal	
	10. Fowler, C.M.R. , 199	0, The Solid Ea	rth. Cambridge
	University Press.	-	J
	11. Jones, E. J. , 1999, M	arine Geophys	ics, John Wiley & Sons.

# 32. Capita of Selecta in Geophysics

Module designation	Capita of Selecta in Geophysics	
Module level	Master	
Code, if applicable	TG6142	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	Third Semester / second Year	
module is taught		
Module coordinator(s)	Dr.rer.nat. R. Mohammad Rachmat ST,MT	
Lecturer(s)	Dr.rer.nat. R. Mohammad Rachmat ST,MT, Fernando Lawre	ens
	Hutapea, ST,MT	
Language	Bahasa Indonesia	
Relation to curriculum	Elective Subject / Elective Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	$\checkmark$
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class using	
	slide in LCD projector, followed by discussion session.	-
	After presentation, they make report what they present	
	before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	_
	groups Lecturer checks how they solve the problem in	
	turns	
	Class project and discussion	
	Last which related to	
	surrent issues and source material	-
	Supervision and consultation	
	This activity is continuation of class project. Students	-
	consults problem which they face and discuss together	
	how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	-
	assistant tell main idea of practical or experimental.	
	They do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to course	-
	material.	

Workload			
	Class lectures		2 hours
	Tutorial session		-
	Supervision and consultation		-
	Practical or experimental labora	tory work	-
	Individual studies	,	8 hours
	Total workload per week		10 hours
	Presentation		_
	Class project		_
	Field trip		
	Total workload per semester		160 hours
			100 110013
Credit points	2		
Requirements prerequisites			
Learning Goals	1	1	
Knowledge	Skill	Competence	
Understand concepts	Understand concept data	<ul> <li>Possess an ext</li> </ul>	ensive
and strategies by	acquisition, process and	knowledge and	ability to
using Geophysical	interpretation of geophysical	integrate geop	hysical
methods for	methods typically used for	data to charac	torizo
exploration and	exploration, e.g., Geoelectric data to characterize		lenze
research	and EM, Gravity, Magnetic		
Understand data	Magnets, Seismic Refraction		
acquisition, process	and Seismic Reflection.		
and interpretation of	<ul> <li>Understand concept of</li> </ul>		
geophysical	borehole geophysical		
methods.	methods, log response		
	characterization		
Content	Concepts and strategies by	using Geophysical	methods for
content	exploration and research [	Data acquisition	process and
	interpretation of geophysical met	hods. Geoelectric an	d EM. Gravity.
	Magnetic Magnets, Seismic Re	fraction and Seism	ic Reflection.
	Borehole geophysical methods, l	og response characte	rization. Rock
	properties, porosity, saturation	on, permeability	and so on.
	Stratigraphic Model, Evaluation of	f prospects.	
Study and examination			0/
examination	Nildterm test	√ 40 √ 40	%
	Final Test	γ 40 20	%
	Presentation, quizzes,	√ 20	%
	homework		
Media employed	Slides, beamer, boards, appropria	ate software, online	
	communication, internet, exercis	es etc.	

Reading list	1. Adi Harsono, Evaluasi Formasi dan Aplikasi Lo, ,
	Schlumberger Oilfield Services, Sentra Mulia, Jakarta,, 1997
	2. Brown, A.R, Interpretation of three-Dimensional seismic
	data, , AAPG memoir 42, AAPG, Tulsa-USA, 1986
	3. Domenico, S.N, Modern Seismic Exploration Concepts, ,
	Amoco prod Comp., Tulsa, Oklahoma, 1983
	4. Dewan, J.T., dan Don J. Timko, Well Log Analisis for
	Geophysicist, , Geoquest International, Inc, 1983
	5. Jain, Kamal, C.,, Concepts and Techniques in Oil and Gas
	Exploration, , Society of Exploration Geophysicists, 1982
	6. Koesoemadinata, R.P.,, Geologi Eksplorasi,, , Diktat GL402,
	Jurusan Teknik Geologi, FTM-ITB, 1990

# **33.** Advanced Engineering Seismology

Module levelMasterCode, if applicableTG6243Sub-heading, if applicable:-Courses included in the module, if applicable:-Semester(s) in which module is taughtFourth Semester / second YearModule coordinator(s)Dr. Wahyu Triyoso, M.Sc.Lecturer(s)Dr. Wahyu Triyoso, M.Sc.LanguageBahasa IndonesiaRelation to curriculumElective Subject / Elective CourseType of teaching, contact hoursClass lectures
Code, if applicableTG6243Sub-heading, if applicable:-Courses included in the module, if applicable:-Semester(s) in which module is taughtFourth Semester / second YearModule coordinator(s)Dr. Wahyu Triyoso, M.Sc.Lecturer(s)Dr. Wahyu Triyoso, M.Sc.LanguageBahasa IndonesiaRelation to curriculumElective Subject / Elective CourseType of teaching, contact hoursClass lectures
Sub-heading, if applicable:-Courses included in the module, if applicable:-Semester(s) in which module is taughtFourth Semester / second YearModule coordinator(s)Dr. Wahyu Triyoso, M.Sc.Lecturer(s)Dr. Wahyu Triyoso, M.Sc.LanguageBahasa IndonesiaRelation to curriculumElective Subject / Elective CourseType of teaching, contact hoursClass lectures
Courses included in the module, if applicable:Fourth Semester / second YearSemester(s) in which module is taughtFourth Semester / second YearModule coordinator(s)Dr. Wahyu Triyoso, M.Sc.Lecturer(s)Dr. Wahyu Triyoso, M.Sc.LanguageBahasa IndonesiaRelation to curriculumElective Subject / Elective CourseType of teaching, contact hoursClass lectures
module, if applicable:Semester(s) in which module is taughtFourth Semester / second YearModule coordinator(s)Dr. Wahyu Triyoso, M.Sc.Lecturer(s)Dr. Wahyu Triyoso, M.Sc.LanguageBahasa IndonesiaRelation to curriculumElective Subject / Elective CourseType of teaching, contact hoursClass lectures
Semester(s) in which module is taughtFourth Semester / second YearModule coordinator(s)Dr. Wahyu Triyoso, M.Sc.Lecturer(s)Dr. Wahyu Triyoso, M.Sc.LanguageBahasa IndonesiaRelation to curriculumElective Subject / Elective CourseType of teaching, contact hoursClass lectures
module is taughtDr. Wahyu Triyoso, M.Sc.Lecturer(s)Dr. Wahyu Triyoso, M.Sc.LanguageBahasa IndonesiaRelation to curriculumElective Subject / Elective CourseType of teaching, contact hoursClass lectures
Module coordinator(s)Dr. Wahyu Triyoso, M.Sc.Lecturer(s)Dr. Wahyu Triyoso, M.Sc.LanguageBahasa IndonesiaRelation to curriculumElective Subject / Elective CourseType of teaching, contact hoursClass lectures
Lecturer(s)Dr. Wahyu Triyoso, M.Sc.LanguageBahasa IndonesiaRelation to curriculumElective Subject / Elective CourseType of teaching, contact hoursClass lectures
LanguageBahasa IndonesiaRelation to curriculumElective Subject / Elective CourseType of teaching, contact hoursClass lectures
Relation to curriculum     Elective Subject / Elective Course       Type of teaching, contact     Image: Class lectures
Type of teaching, contact     Image: Class lectures
hours Class lectures
Lecturer teaches students in class. There will be pop
quizzes, task, or homework in some classes. Lecturer $$
presents course material using media such as slide in
LCD projector and whiteboard.
Presentation
Students present course materials in front of class
using slide in LCD projector, followed by discussion $$
session. After presentation, they make report what
they present before.
Tutorial session
Lecturer gives students some problem beforehand. In
class students explain how to solve the problem in -
groups. Lecturer checks how they solve the problem in
turns.
Class project and discussion
Lecturer gives students a project which related to $$
current issues and course material.
Supervision and consultation
This activity is continuation of class project. Students
consults problem which they face and discuss together $\sqrt[\gamma]{}$
how to solve the problem.
Practical or experimental laboratory work
Students do practical or experimental in the laboratory
according to practical module. Firstly, laboratory
assistant tell main idea of practical or experimental.
They do the practical afterwards.
Field trip
Visit field area or company which is related to course
material.

Class lectures 2 hour	
Tutorial session	
Supervision and consultation 2 hour	
Practical or experimental laboratory work	
Individual studies 6 hour	;
Total workload per week 10 hou	s
Presentation 4 hour	<u> </u>
Class project 6 hour	
Field trip	<u> </u>
Total workload per semester 160 hou	rs
Credit points 2	
Requirements prerequisites	
Learning Goals	
Knowledge Skill Competence	
Knowledge Skin Competence	+
Understanding strong ground      Able to proficient in basic      Could construct     the Sairm	
motion due to earthquake. analysis on strong ground the Seism	Ľ
Understanding Ground Motion motion and GMPE.     Hazard     Eusetion (SHE	
Prediction Equation (GMPE). • Able to proficient in Function (SHP	•
Understanding Seismicity Rate determining seismicity rate	a
Modeling. model. Simple	
Understanding seismic hazard     Able to proficient in basic	
analysis and Seismic Hazard analysis on deterministic deterministic	
Function. and probabilistic.	
Inderstanding local site effects     Able to proficient in basic	
analysis on amplification.	
Content Basic concept of seismology; waves propagation in unbour	ded
media, semi-infinite body, layered body, attenuation; disasters	due
to earthquake; measurements, parameter, and estimation	of
parameters of strong ground motion; ground acceleration du	e to
earthquake subduction and fault/crustal; local site effects on gro	und
motion; seismic zoning based on ground acceleration and o	ther
earthquake parameters; probability of earthquake occurre	ice;
probabilistic and deterministic seismic hazard analysis	
Study and examination Midterm test $\sqrt{40\%}$	
Final Test $\sqrt{40\%}$	
examination Presentation, quizzes,	
homework V 20%	
Laboratory work -	
Media employed Slides beamer boards appropriate software online	
communication internet exercises etc	
Peading list 1. S.L. Kramer, Geotochnical Earthquake Engineering, Prontice Hall	
New Jerson 1006	
New Jersey, 1990	
2. K. Ishinara, ivianual for Zonation on Seismic Geolechnical Hazara	'' ina
1993	ч <u>в</u> ,
3. F.A. Keller, Environmental Geology, Charles F. Merrill Publishing	
Company, 1979 4. Bulletin of Seismological Society of America	

# 34. Surface Wave Exploration

Module designation	Surface Wave Exploration	
Module level	Master	
Code, if applicable	TG6244	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	Fourth Semester / second Year	
module is taught		
Module coordinator(s)	Dr. Tedi Yudistira, S.Si.,M.Si.	
Lecturer(s)	Dr. Tedi Yudistira, S.Si., M.Si., Fernando Lawrens Hutapea, S	5.T. <i>,</i> M.T.
Language	Bahasa Indonesia	
Relation to curriculum	Elective Subject / Elective Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	$\checkmark$
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class	
	using slide in LCD projector, followed by discussion	$\checkmark$
	session. After presentation, they make report what	
	they present before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	-
	groups. Lecturer checks how they solve the problem in	
	turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	$\checkmark$
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	1
	consults problem which they face and discuss together	N
	how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	-
	assistant tell main idea of practical or experimental.	
	They do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to course	-
	material.	

Workload				[	
	Class lectures			2 hours	
				-	
	Supervision and consultation			2 hours	
	Practical or experimental la	aboratory wor	k	-	
	Individual studies			6 hours	
	Total workload per week			10 hours	
	Presentation			4 hours	
	Class project			6 hours	
	Field trip			-	
	Total workload per semest	er		160 hours	
Cradit paints	2				
	2				
Requirements prerequisites					
Learning Goals				]	
Understand the basic	Able to calculate dispe	rsive curve	Posses t	he ability	
characteristic of seismi	c for simple model using	computer	to conne	ect	
surface waves based of	n programming.		betweel	1	
physical formulation.	Capable to measure di	spersive	alspersi	ve	
<ul> <li>Understand the dispersive share starieti</li> </ul>	curve of real seismic da	ata, both	the curf		
of soismis surface	using manual and com	puterized	the surface waves		
or seismic surface	program.			and seismic	
waves for simple	Capable to Implement	Inverse	distribut	tion of	
model.	method on surface wa	ve	cubcurf		
	modelling.		Subsuite	ice.	
Content Study and examination requirements and forms of examination	Seismic wave review: elast Dispersive waves: dispersive of phase velocity and group model; Survey: noise interf processing concept: Fourie Dispersive signal analysis: ba wave inversion: basic concep Velocity structure inversion: r forward modelling (basic). Midterm test Final Test Presentation, quizzes, homework	ic waves, boo concept, wav velocity, surfa ferometry, ar er concept, c sic concept, c sic concept, sp it, model parame model parame	dy wave, s e superpos ace wave fo ray microtu correlation, pectrum me meterizatio terization, l 35 35 35 30	urface wave; ition, concept r two layered remor; Signal convolution; thod; Surface n, ray tracing; Rayleigh wave	
	nomework				
	Laboratory work	-			
Media emploved	Slides, beamer, boards, appr	opriate softwa	are, online		
	communication. internet. exe	ercises etc.	-,		
Reading list	1. Shearer, P.M. Introducti	ion to Seismol	ogy, Camhr	idge	
	University 1999		- 077 - 2211 01	- 0 -	
	2 S Stein & M Wysession	An Introducti	on to Seism	oloav	
	Earthquakes and Earth S	Structure, Blac	kwell Publis	hing, 2003.	

35.	<b>Applied Geo</b>	EM in Earth	Sciences and	Technology
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Module designation	Applied GeoEM in Earth Sciences and Technology	
Module level	Master	
Code, if applicable	TG5011	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	Third Semester / second Year	
module is taught		
Module coordinator(s)	Dr.rer.nat. Widodo, ST, MT	
Lecturer(s)	Dr.rer.nat. Widodo, ST, MT	
Language	Bahasa Indonesia	
Relation to curriculum	Elective Subject / Elective Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	$\checkmark$
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class	
	using slide in LCD projector, followed by discussion	-
	session. After presentation, they make report what	
	they present before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	-
	groups. Lecturer checks how they solve the problem in	
	turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	$\checkmark$
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	
	consults problem which they face and discuss together	N
	how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	-
	assistant tell main idea of practical or experimental.	
	They do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to course	-
	material.	

Workload		
	Class lectures	2 hours
	Tutorial session	-
	Supervision and consultation	2 hours
	Practical or experimental laboratory work	-
	Individual studies	6 hours
	Total workload per week	10 hours
	Presentation	-
	Class project	80 hours
	Field trip	-
	Total workload per semester	160 hours
	2	
Requirements prerequisites		
Learning Goals		
Knowledge	Skill Competer	ıce
<ul> <li>Understand basic background of geoelectric and electromagnetic Methods.</li> <li>Understand application of geoelectric and electromagnetic methods in many application of geosciences cases.</li> <li>Understand design surveys of geoelectric and electromagnetic methods.</li> </ul>	<ul> <li>Able to apply geoelectric and electromagnetic methods in order to solve the problem of exploration, environmental and hazard mitigation.</li> <li>Understand to modeling the geoelectric and electromagnetic models in the scheme of forward and inversion models.</li> <li>Familiar in design survey of geoelectric and electromagnetic methods</li> <li>Able to analysis the exploration problem using geoelectric and electromagnetic methods</li> </ul>	of er to solve the case of loration. nodeling of data in the ard and l. gn survey of methods. ysis the blem using c methods
Content		
	Methods) in many cases of exploration including Ma Coastal Hydrology, Mineral Exploration, Marine EM / Float EM, Electromagnetic Surveys in Geothermal Studies, Instrumentation & Measurement of TDEM, I Application for Electrical Submersible Pump, Forward Time-Lapse Microgravity by Considering Water Tak Compaction and Subsidence Cause by Ground Wate Case Study Bandung Basin Area, Role of Geophysical I Reducing Hydrocarbon Emissions, The role of subsur slope stability analysis – A case study from the Jak highspeed railway tunnel project, Predicting Meta Routes from Mineralogical Data, Rock Physics Modelli	Airborne EM, and Volcano Data Analytics Modelling of De Flow, Soil er Extraction, Engineering in face survey in carta-Bandung al Production ing,

Study and examination				
requirements and forms of	Midterm test		40 %	
examination	Final Test		40 %	
	Presentation, quizzes,	$\checkmark$	20 %	
	homework	,		_
	Laboratory work	-	-	
Media employed	Slides, beamer, boards communication, internet, ex	, appropriat ercises etc.	te software, c	online
Reading list	<ol> <li>Hinze, W.J., Von Frese, F Magnetic Exploration: I Cambridge Univer-si-ty F</li> <li>Jensen, J.R. (2000) Ren Earth Resource Perspect</li> <li>Mavko, G., Mukerji, T. Handbook: Tools for Cambridge University Pr</li> <li>Moon, C.J., Whateley., Introduction to mineral Sons, Ltd., , ,</li> <li>Reynolds, J.M., (1998) Environmental Geophys</li> <li>Telford, W.M., Geldart, 2nd edition, Cambridge</li> <li>Sharma, P. V., (199) Geophysics: Cambridge</li> <li>Zhdanov, M.S., Keller, G in Geophysical Exploration</li> <li>M. Nabigian (ed.), E Geophysics, vol. 1 Th Exploration Geophysicist</li> <li>Sun X, Zhan Y, Unsworth G, Sun J, Zhao L, Cui T, Li of the easternmost Kunl and the seismotectonic: Journal of Geophysic https://doi.org/10.1029,</li> <li>Widodo, An Innovation EM), Research Report LF</li> </ol>	R.R.B. & Saad, A Principles, Pra Press, , , note Sensing of tive, , , and Dvorkin, Seismic Analy ess, Cambridge Michael K.G exploration 2r Michael K.G exploration 2r An Introdu ics, Wiley, , , L.P. & Sheriff, University Press V., (1994). The on, Elsevier, , , lectromagnetic eory, vol. 2 ts, 1989., , , MJ, Egbert GE u Z, Han J, 3-D un fault: insigh s of the Jiuzha cal Research /2020JB019732 of Electroma	A.H., (2013). Gravit ctices and Applica of the Environmen J. (2009). Rock Physis in Porous M e.,,, ., Evans, A.M., (2 nd edition; John Wi action to Applied R.E., Applied Geoph ss, 2004.,,, ental and Engine ss, 2004.,,, ental and Engine ss, ,, e Geoelectrical Mer c methods in Application, Socie D, Zhang H, Chen X, Magnetotelluric im ts into strain partiti- igou Ms7.0 earthq : Solid Earth, 1, 2020, ,, gnetic Methods (F	y and tions, t: An nysics ledia. 009). ley & and nysics ering thods oplied ty of Zhao aging oning uake, 125, LOAT
		,		

### 36. Thesis 1

Module designation	Thesis 1	
Module level	Master	
Code, if applicable	TG6091	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	third Semester / second Year	
module is taught		
Module coordinator(s)		
Lecturer(s)	Dr.rer.nat. Andri Hendriyana, S.T., M.T., Dr. Zulfakriza, S.T.,	M.T.
Language	Bahasa Indonesia	
Relation to curriculum	General Course / Compulsory Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	-
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class	
	using slide in LCD projector, followed by discussion	
	session. After presentation, they make report what	,
	they present before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	2
	groups Lecturer checks how they solve the problem in	v
	turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	2
	current issues and course material	v
	Supervision and consultation	
	This activity is continuation of class project. Students	
	consults problem which they face and discuss together	$\checkmark$
	how to solve the problem	
	Dractical or experimental laboratory work	
	Students de prestigel er evperimentel in the leberatory	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	-
	They do the prostical of terrurade	
	ritey do the practical atterwards.	
	Visit field area or company which is related to course	-
	material.	

Workload	Class lasturas	4 hours		
		4 hours		
	Tutorial session	4 nours		
	Supervision and consultation	12 haven		
	Practical or experimental laboratory work			
	Individual studies			
	Total workload per week	2 hours		
	Presentation	Depend on		
		thesis		
	Class project	project		
	Field trip	320 hours		
	Total workload per semester	4 hours		
		4 110013		
Credit points	4			
Requirements prerequisites				
Learning Goals				
Knowledge	Skill Cor	mpetence		
<ul> <li>Understand how to</li> </ul>	Able to define a research     Possess	ability to write a		
formulate a research	topic and to determine a thesis p	roposal.		
topic and to choose a	research methodology.			
research methodology.				
	· · ·			
Content	1. Study the existing research results for a particular research	arch problem		
	2. Find a potential problem and its solution			
	3. Write a thesis proposal			
	4. Research including data processing and present prelim	inary results		
Study and examination				
requirements and forms of	Midterm test -	-		
examination	Final Test -	-		
	Presentation, quizzes,	100 %		
	homework	100 /0		
	Laboratory work -	-		
	- Clisten hannen hannele sons sinteres fi			
iviedia employed	sildes, beamer, boards, appropriate software, o	onine		
	communication, internet, exercises etc.			
Reading list	Based on Thesis topics			

### 37. Thesis 2

Module designation	Tesis 2	
Module level	Master	
Code, if applicable	TG6092	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	fourth Semester / second Year	
module is taught		
Module coordinator(s)	Dr.Ir. Fatkhan, MT	
Lecturer(s)	Dr.Ir. Fatkhan, MT	
Language	Bahasa Indonesia	
Relation to curriculum	General Course / Compulsory Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	-
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class	
	using slide in LCD projector, followed by discussion	
	session. After presentation, they make report what	,
	they present before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	2
	groups Lecturer checks how they solve the problem in	v
	turns	
	Class project and discussion	
	Lecturer gives students a project which related to	
	current issues and course material	N
	Current issues and concultation	
	This activity is continuation of class project. Students	
	This activity is continuation of class project. Students	$\checkmark$
	consults problem which they face and discuss together	
	Now to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	-
	assistant tells main idea of practical or experimental.	
	I hey do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to course	-
	material.	

Workload							
		Class lectures					
		Tutorial session				4 hours	i
		Supervision and consultati	on			4 hours	;
		Practical or experimental l	abora	tory wor	k		
		Individual studies				12 hours	s
		Total workload per week				20 hours	s
		Presentation				2 hours	i i
		Class project				Depend c	n
						thesis	
						project	
		Field trip				ļ	
		Total workload per semest	er			320 hour	ſS
Credit noints	4						
Requirements prerequisites							
	1						
Learning Goals							
Knowledge		Skill			Competer	ICE	٦
Understand how to	Able to solve geophysical     Possess ability t		ess ability to	write			
analyze Geophysical dat	а	broblems thesis and pape		and paper	S.		
and to process		problems.			and paper		
Content	Re	esearch for master degree i	incluc	ling 1. Da	ta processi	ng 2.	
	In	terpretation 3. Method 4.	Writir	ng of thes	is 5. Manus	script	
	su	bmitted to International Jo	ourna	Ī		-	
Study and examination							
requirements and forms of		Aidterm test		_	_		
examination	F	inal Test		_	_		
	F	Presentation, guizzes.		1			
	ŀ	nomework			100	%	
	L	aboratory work		_	-		
		· · · · ·	• •	<i>C</i> .		I	
Media employed	Sli	des, white boards, approp	riate	software,	, online con	imunicatio	on,
	in	ternet, exercises etc.					
Reading list	Ba	sed on Thesis topics					

# 38. Advanced Electromagnetic Method

Module designation	Advanced Electromagnetic Method	
Module level	Master	
Code, if applicable	TG5264	
Sub-heading, if applicable:	-	
Courses included in the		
module, if applicable:		
Semester(s) in which	Third Semester / second Year	
module is taught		
Module coordinator(s)	Dr.rer.nat. Wahyudi P Parnadi, MS	
Lecturer(s)	Dr.rer.nat. Wahyudi P Parnadi, MS, Dr.rer.nat. Widodo, ST,	MT
Language	Bahasa Indonesia	
Relation to curriculum	Elective Subject / Elective Course	
Type of teaching, contact		
hours	Class lectures	
	Lecturer teaches students in class. There will be pop	
	quizzes, task, or homework in some classes. Lecturer	$\checkmark$
	presents course material using media such as slide in	
	LCD projector and whiteboard.	
	Presentation	
	Students present course materials in front of class	
	using slide in LCD projector, followed by discussion	-
	session. After presentation, they make report what	
	they present before.	
	Tutorial session	
	Lecturer gives students some problem beforehand. In	
	class students explain how to solve the problem in	-
	groups. Lecturer checks how they solve the problem in	
	turns.	
	Class project and discussion	
	Lecturer gives students a project which related to	$\checkmark$
	current issues and course material.	
	Supervision and consultation	
	This activity is continuation of class project. Students	1
	consults problem which they face and discuss together	V
	how to solve the problem.	
	Practical or experimental laboratory work	
	Students do practical or experimental in the laboratory	
	according to practical module. Firstly, laboratory	-
	assistant tell main idea of practical or experimental.	
	They do the practical afterwards.	
	Field trip	
	Visit field area or company which is related to course	-
	material.	

Workload			
	Class lectures		2 hours
	Tutorial session		-
	Supervision and consultation		2 hours
	Practical or experimental labora	tory work	-
	Individual studies		6 hours
	Total workload per week		10 hours
	Presentation		-
	Class project		80 hours
	Field trip		-
	Total workload per semester		160 hours
Credit points	2		
Requirements prerequisites			
	CL:II	<b>Ca a a a b a</b>	
knowledge	SKIII	Competer	ice
<ul> <li>Understand advanced background of electromagnetic Method.</li> <li>Understand design surveys electromagnetic method.</li> <li>Understand the innovation of electromagnetic method in the scheme to solve the problem of environmental and engineering geophysics.</li> </ul>	<ul> <li>Able to apply electromagnetic method in order to solve the problem of exploration, environmental and hazard mitigation.</li> <li>Understand modelling of electromagnetic data in the scheme of forward and inversion models.</li> <li>Familiar in design survey of geoelectric and electromagnetic methods</li> <li>Able to analysis the exploration problem using electromagnetic method.</li> </ul>	<ul> <li>Take possessi capability in o solve the prof case of geoph exploration.</li> <li>Familiar in the of electromage in the scheme forward and i model.</li> <li>Familiar in de survey of electromagne method.</li> <li>Familiar to an exploration pu using electror method.</li> </ul>	on of order to olem in the hysical e modeling gnetic data e of nversion sign etic halysis the roblem magnetic
Content	The role of electromagnetic (EM) oil & gas as well as other earth propagation; electric and magnetic time domain EM, frequency dom types of source/transmitter and magnetotellurics (MT), controlled (CSAMT), radio magnetotellurics ( Transient EM (TEM) etc.; high free Radar (GPR), Radar; practical wor TEM), practical works with high application in geotechnical en hydrogeological studies, earth cru seminar/class presentation.	method in searchin resources; review properties of miner ain EM; far field and receiver; low fro d-source audio ma RMT), Very Low Fre equency EM: Groun rks with low-frequen h-frequency EM (G gineering, mining ist studies, oil & gas	g for mineral, of EM wave rals and rocks; nd near field; equency EM: gnetotellurics quency (VLF), d-penetrating ency EM (VLF, GPR); and its engineering, s exploration;

Study and examination				
requirements and forms of	Midterm test		40 %	
examination	Final Test		40 %	
	Presentation, quizzes, homework	$\checkmark$	20 %	
	Laboratory work	-	-	
Media employed	Slides, beamer, boards communication, internet, ex	s, appropriat ercises etc.	te software, onl	ine
Reading list	<ol> <li>Reynolds, J.M., An Intro Geophysics, 2nd Edition</li> <li>Telford, W.M., Gelgard, Cambridge University Pr</li> <li>Zhdanov, M.S. and G. V. in Geophysical Explorati</li> <li>W. M. Telford, L. P. Ge Geophysics, Cambridge</li> <li>Sullivan, D. M., 2000, FDTD Method, IEEE Press</li> <li>Nabighian, M. N., 1991 Geophysics: Applicatio Geophysics, No. 3), SEG</li> <li>Strack, KM., 1992, Electromagnetics, Elsevi</li> <li>Annan, A. P., 2001, Wor</li> <li>Kelly W. E. and S. M Hydrogeological and Eng</li> </ol>	pduction to App oduction to App ISBN: 978-0-4 L.P., Sheriff, R ress, 1990. Keller, 1994, Th on, Elsevier. Eldart, and R. E University Pres Electromagnet is. , Electromagnet is. , Electromagnet is.	olied and Environmen 171-48535-3,2011. E., Applied Geophysi e Geoelectrical Metho S. Sheriff, 1990, Appli s, 2nd ed. ic Simulation using t etic Methods in Appl d B (Investigations with Deep Transie R, Sensors & Software Applied Geophysics ice	ital ics, ods ied the in ent ent