Module Handbook

Undergraduate Programme in Geophysical Engineering

FACULTY OF MINING AND PETROLEUM ENGINEERING
INSTITUT TEKNOLOGI BANDUNG
2022

Table of Contents

Module Handbook Lists

Undergraduate Program of Geophysical Engineering

No	Code	Module Name	Credit
1	MA1101	Mathematics IA	4
2	FI1101	Elementary Physics IA	4
3	KI1101	General Chemistry IA	3
4	KU1164	Introduction to Mineral & Energy Resources	2
5	KU1072	Introduction to Computation	2
6	KU1024	English	2
7	MA1201	Mathematics IIA	4
8	FI1201	Elementary Physics IIA	4
9	KI1201	General Chemistry IIA	3
10	KU1011	Scientific Writing	2
11	KU1001	Sports	2
12	KU1202	Introduction to Engineering & Design	2
13	GL2111	Physical Geology	3
14	KU2071	Pancasila and Civic Education	2
15	TG2101	Geomathematics 1	3
16	TG2102	Wave in Geophysics	3
17	TG2103	Basic Geophysics	2
18	TG2104	Geophysical Instrumentation	3
19	TG2105	Computing in Geophysics	3
20	GD2001	Introduction on Surveying	2
21	GL2141	Introduction to Mineralogy and Petrology	3
22	KU2061	Religion and Ethics (Islamic)	2
23	TG2203	Geomathematics II	3
24	TG2204	Potential Theory	2
25	TG2201	Geostatistics I	3
26	TG2231	Seismology	3
27	GL2012	Structural Geology	3
27	GL3053	Sedimentology and Stratigraphy	3
29	TG3110	Geophysical Signal Analysis	3
30	TG3102	Geostatistics II	2
31	TG3109	Seismic Refraction	3
32	TG3132	Earth Crust Mechanics	2
33	TG3201	Geophysical Thermodynamics and Fluid Dynamic	2
34	TG3261	Seismic Data Acquisition	3
35	TG3241	Geo-electromagnetism	3
36	TG3263	Gravity and Geomagnetics	3
37	TG3222	Geodynamics	2

38	TG3290	Fieldwork	3
39	TG3001	Advanced Geophysical Instrumentation	3
40	TG4001	Communication in Geophysics	2
41	TG4092	Final Project I	2
42	TG4162	Seismic Interpretation	3
43	TG4141	Geophysical Inversion	2
44	TG4029	Capita of Selecta in Geophysics	2
45	TG4047	Design in Geophysical Engineering	2
46	TG4063	Special Topic in Geophysics	2
47	TG4067	Job Training	2
48	TG4128	Geotomography	3
49	TG4142	Engineering & Environmental Geophysics	3
50	TG4166	Rock Physics	2
51	TG4092	Final Project II	3
52	TG4269	Economical Geophysics and Management	2
53	TG4243	Volcanology and Geothermal Exploration	3
54	TG4223	Numerical Simulation of The Earthquake	3
55	TG4225	Applied Seismology	2
56	TG4226	Physics of the Earth’s Interior	2
57	TG4264	Earthquake and Fault Mechanism	2
58	TG4264	Seismic Inversion for Reservoir	3
59	TG4265	Seismic Attributes for Reservoir	2
60	GL4168	Introduction to Seismic Stratigraphy	2

Undergraduate Program of Geophysical Engineering

1. Mathematics IA

Module designation	Mathematics IA
Module level	Bachelor
Code, if applicable	MA1101
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Mathematics IA
Semester(s) in which module is taught	First Year
Module coordinator(s)	Drs. Warsoma Djohan, M.S.
Lecturer(s)	Drs. Warsoma Djohan, M.S.
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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>4 hours</td></tr>
<tr><td>Tutorial session</td><td>4 hours</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>12 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>192 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>4</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td>Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding the basic technical ability on the appropriate concepts, formulae, methods, and thinking.</td><td>• Able to solve calculus related problem creatively, and having systematic, logical, and critical thinking.
• Able to communicate their works and their thinking orally and in written papers.</td><td>• Possess the readiness to learn other courses that need calculus as the prerequisite.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>This course gives rigorous understanding of some topics in calculus as one of the fundamental courses in mathematics to prepare the students in learning advanced topics. It covers functions and limit, derivatives and their applications, integrations and their applications, transcendental functions, and technique of integrations</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>30%</td></tr>
<tr><td>Presentation, quizzes, homework</td><td>√</td><td>40%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides and LCD projectors, blackboards</td></tr>
<tr><td>Reading list</td><td>1. Thomas, Calculus, Pearson Education, 2010, 12th ed.
2. James Stewart, Calculus, Brooks/Cole Publishing Company, 1999, 4th ed.
3. Dale Varberg, Edwin Purcel and Steve Rigdon, Calculus, Prentice Hall, 2007, 9th ed.</td></tr>
</table>

2. Elementary Physics IA

Module designation	Elementary Physics IA
Module level	Bachelor
Code, if applicable	FI1101
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Elementary Physics IA
Semester(s) in which module is taught	First Year
Module coordinator(s)	Dr. Enjang J. Mustopha
Lecturer(s)	Dr. Enjang J. Mustopha
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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>4 hours</td></tr>
<tr><td>Tutorial session</td><td>3 hours</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>2 hours</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>12 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>192 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>4</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr>
<td>• Understanding the concept of vectors and basic concepts and principles in mechanics, fluid, elasticity and oscillation, and thermodynamics.</td>
<td>• Able to plan and prepare practical laboratory investigations on Newton mechanics.
• Able to conduct experiments and record data using a variety of suitable instruments for Newton mechanics experiments.
• Able to conduct experiment in a responsible and compliance way to the relevant health and safety regulations.</td>
<td>• Possess the ability to apply the concept of vectors and Newton’s laws for a single particle and for a system of particles in 1, 2, and 3 dimensions.
• Possess the ability to apply the concept of work-energy for solving simple problems in mechanics.
• Possess the ability to formulate, solve and analyze problems of statics and dynamics of rigid body systems.
• Possess the ability to solve problems in statics and dynamics of fluids.
• Possess the ability to solve and analyze problems in thermodynamics.
• Possess the ability to analyze and interpret experimental data on Newtonian mechanical experiments using knowledge of mathematics and physics.
• Possess the ability to design a simple device that uses the concepts of Elementary Physics IA (RBL).</td>
</tr>
</table>
</td></tr>
</table>

<table>
<tr><td>Content</td><td>Kinematics of Point Objects, Relative Motion, Dynamics of Point object (Newton's laws of the force concept, work and energy, impulse and momentum, conservation laws), Dynamics System of point Objects (center of mass), Rotational motion (angular momentum, rigid body rotation with a fixed axis), Elasticity and Oscillations, Wave Mechanics, Statics and Fluid Dynamics, Thermophysics (kinetic theory of gases, Heat and work, The first law of thermodynamics , efficiency, Carnot cycle)</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td><table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>30%</td></tr>
<tr><td>Presentation, quizzes, homework</td><td>√</td><td>10%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>20%</td></tr>
</table></td></tr>
<tr><td>Media employed</td><td>Slides and LCD projectors, blackboards, lab</td></tr>
<tr><td>Reading list</td><td>1. Halliday, D., Resnick, R., and Walker, J., Principle of Physics, 9th ed. Extended, John Wiley & Sons, 2011.
2. Serway, R.A., Physics for Scientists and Engineers. Sander College, 1996.
3. Alonso, M. & Finn, E.J. Physics. Addison Wesley, 1992.</td></tr>
</table>

3. General Chemistry IA

Module designation	General Chemistry IA
Module level	Bachelor
Code, if applicable	KI1101
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	General Chemistry IA
Semester(s) in which module is taught	First year
Module coordinator(s)	Dr. Bambang Prijamboedi
Lecturer(s)	Dr. Bambang Prijamboedi
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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>1 hours</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>3 hours</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>10 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>160 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr>
<td>• Understand atoms, elements, ionic compounds, molecular compounds identification.
• Understand the concept of mole, limiting reactions and reaction yields.
• Understand electrolytes, acids and bases identification, and understand the acid-base nomenclature, molarities and reactions in solution.
• Understand the oxidation and reduction reactions.
• Understand the concept of energy and its relation with the chemical change, works, internal energy, first law of thermodynamics, Hess’s law.
• Understand the concept of entropy, second and third law of thermodynamics, Gibbs free energy, bond energy.
• Understand the atomic spectra, the Bohr Theory,</td>
<td>• Able to determine the relation between chemical reactions in molecular scale and macroscopic scale such as mass, empirical and molecular formula.
• Able to use titration methods and several chemical analyses to solve some problems related to the solution properties.
• Able to balance the oxidation-reduction reactions and calculate the mass involved in the oxidation-reduction reaction.
• Able to determine the amount of heat that related to a chemical reaction
• Able to determine the molecular structure and its geometry for a chemical compound.</td>
<td>• Possess the reasoning ability of the relation between microscopic world in molecular level and macroscopic level through the mole and stoichiometry concepts, theory and description of atoms and molecules and its relation with the properties of materials.
• Possess the ability to use some basic chemical analytical method to understand and explain some chemical phenomena and also to identify the chemical properties of common chemical substances.</td>
</tr>
</table>
</td></tr>
</table>

wave model of atom, spin, atomic orbital. • Understand ionic bonding, covalent bonding and understand the concept of polar molecule, Lewis structure identification. • Understand geometry of molecular structure, bonding types in molecules and matters identification. • Understand the ideal and real gas law, Dalton's gas law. • Understand the intermolecular forces in materials, Le chatelier principle. • Understand structure of crystalline solids, crystal types identification and its physical properties.		

Content	Atoms, elements and compounds; Concepts of mole and stoichiometry; Reaction in aqueous solution; Oxidation-reduction reactions; Energy and chemical reaction; Thermodynamics; Theory of atoms based on quantum mechanics; Chemical bonding; Molecular structure; Properties of gases; Intermolecular force and properties of liquids and solids.
Study and examination requirements and forms of examination	
Media employed	Slides, Beamer, boards, internet, exercises, laboratory
Reading list	1. James E. Brady, Neil D. Jespersen and Alison Hyslop, Chemistry 6th Edition, John Wiley and Sons, 2012. 2. Raymond Chang, Chemistry 10th Edition, McGraw-Hill, 2010.

Midterm test	√	40%
Final Test	√	40%
Presentation, quizzes, homework	√	10%
Laboratory work	√	10%

4. Introduction to Mineral & Energy Resources

Module designation	Introduction to Mineral and Energy Resources
Module level	Bachelor
Code, if applicable	KU1164
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Introduction on Mineral and Energy Resources
Semester(s) in which module is taught	First Year
Module coordinator(s)	Prof. Ridho Kresna Wattimena
Lecturer(s)	Prof. Sri Widiyantoro, Prof. Djoko Santoso, Dr. Darharta Dahrin, Dr. Afnimar, Dr. Budi Sulistyo, Prof. Syoni Soepriyanto, Dr. Sutopo, Prof. Awali Priyono, Dr. Fatkhan, Dr. Muhamad Nur Heriawan, Dr. Aryo Prawoto Wibowo, Prof. Doddy Abdassah, Prof. Tutuka Ariaji
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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding the history, development and scope of geosciences.
• Understanding the inner structure of the earth and its physical properties.
• Understanding the potential of the mining resources in Indonesia, from exploration to exploitation.</td><td>• Able to map the mining resources using geoscience techniques and methods explained in the class.</td><td>• Possess an extensive knowledge to describe the inner structure of the earth and its mining resources potential.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Class orientation and team preparation, student team activities: problem definition and formulation, propose alternative solution and conceptual design.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>Students are considered to be competent and pass if students completed the task under designated criteria. Final grade is scaled to the degree of accomplishments to design criteria</td></tr>
<tr><td>Media employed</td><td>Slides, Beamer, boards</td></tr>
<tr><td>Reading list</td><td>1. Howe, Charles W., Natural Resource Economics. John Wiley & Sons, N.Y. 1979
2. Gocht, W.R., H. Zantop, R.G. Eggert., International Mineral Economics. Springer- Verlag, Germany, 1988
3. Sharma, P. V., 1997, Environmental and Engineering Geophysics: Cambridge University Press.</td></tr>
</table>

5. Introduction to Computation

Module designation	English
Module level	Bachelor
Code, if applicable	KU1024
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	English
Semester(s) in which module is taught	First Year
Module coordinator(s)	Dr. Bambang Supriyanto, M.Ed.
Lecturer(s)	Dr. Bambang Supriyanto, M.Ed.
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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understand to identify parts of a paragraph.
• Understand to assess the quality of paragraphs.
• Understand to identify the parts of an essay.</td><td>• Able to develop a paragraph in various methods.
• Able to compose a cohesive and coherent paragraphs.
• Able to link ideas between sentences and paragraphs.
• Able to organize a cohesive and coherent essay.</td><td>• Possess an extensive knowledge to write a scientific essay.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Train the students’ critical thinking skills in reading activities that include (a) before the reading is done, (b) at the time of reading is in progress, and (c) after the reading is over. Students will also learn materials on academic writing that comprise sentence structures and types of sentences; parts and kinds of paragraphs; parts and kinds of essay; vocabulary; spelling; citation and references</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>40%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>30%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Whiteboard, computer, slides, beamer, boards, etc.</td></tr>
<tr><td>Reading list</td><td>1. Bander, R., From Sentence to Paragraph. Canada: CBS College Publishing 1981.
2. English, K.A., Northstar: Reading and Writing. New York: Longman. 2004.
3. Frank, M., Sentences and Complex Sentences. New Jersey: Prentice Hall. 1972.
4. Oshima, A. and Ann Hague. Writing Academic English. New York: Longman. 1999.</td></tr>
</table>

	5. KK Ilmu Kemanusiaan, FSRD-ITB. Academic Writing. Bandung: Penerbit ITB. 2013.(Main Reference) 6. Strauch, O.A. Writers at Work: The Short Composition. Cambridge: Cambridge University Press. 2005. 7. Williams, A. Writing for IELTS. London: Harper Collins. 2011. 8. Wingersky, J. Et al. Writing Paragraphs and Essays. California: Wardsworth Publishing Company. 1995. 9. Zemach, E.D. Writers at Work: The Essay. Cambridge: Cambridge University Press. 2008.

6. English

Module designation	English
Module level	Bachelor
Code, if applicable	KU1024
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	English
Semester(s) in which module is taught	First Year
Module coordinator(s)	Dr. Bambang Supriyanto, M.Ed.
Lecturer(s)	Dr. Bambang Supriyanto, M.Ed.
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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understand to identify parts of a paragraph.
• Understand to assess the quality of paragraphs.
• Understand to identify the parts of an essay.</td><td>• Able to develop a paragraph in various methods.
• Able to compose a cohesive and coherent paragraphs.
• Able to link ideas between sentences and paragraphs.
• Able to organize a cohesive and coherent essay.</td><td>• Possess an extensive knowledge to write a scientific essay.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Train the students’ critical thinking skills in reading activities that include (a) before the reading is done, (b) at the time of reading is in progress, and (c) after the reading is over. Students will also learn materials on academic writing that comprise sentence structures and types of sentences; parts and kinds of paragraphs; parts and kinds of essay; vocabulary; spelling; citation and references</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>40%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>30%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Whiteboard, computer, slides, beamer, boards, etc.</td></tr>
</table>

Reading list	1. Bander, R., From Sentence to Paragraph. Canada: CBS College Publishing 1981. 2. English, K.A., Northstar: Reading and Writing. New York: Longman. 2004. 3. Frank, M., Sentences and Complex Sentences. New Jersey: Prentice Hall. 1972. 4. Oshima, A. and Ann Hague. Writing Academic English. New York: Longman. 1999. 5. KK Ilmu Kemanusiaan, FSRD-ITB. Academic Writing. Bandung: Penerbit ITB. 2013.(Main Reference) 6. Strauch, O.A. Writers at Work: The Short Composition. Cambridge: Cambridge University Press. 2005. 7. Williams, A. Writing for IELTS. London: Harper Collins. 2011. 8. Wingersky, J. Et al. Writing Paragraphs and Essays. California: Wardsworth Publishing Company. 1995. 9. Zemach, E.D. Writers at Work: The Essay. Cambridge: Cambridge University Press. 2008.

7. Mathematics IIA

Module designation	Mathematics IIA
Module level	Bachelor
Code, if applicable	MA1201
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Mathematics IIA
Semester(s) in which module is taught	First Year
Module coordinator(s)	Drs. Warsoma Djohan, M.S.
Lecturer(s)	Drs. Warsoma Djohan, M.S.
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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>4 hours</td></tr>
<tr><td>Tutorial session</td><td>4 hours</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>12 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>192 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>4</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding the basic technical ability on the appropriate concepts, formulae, methods, and thinking.</td><td>• Able to solve calculus related problem creatively, and having systematic, logical, and critical thinking.
• Able to communicate their works and their thinking orally and in written papers.</td><td>• Possess the readiness to learn other courses that need calculus as the prerequisite.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>This course gives rigorous understanding of some topics in calculus as one of the fundamental courses in mathematics to prepare the students in learning advanced topics. It covers techniques of integration, infinite series, parametric equations, vectors and geometry in space, derivatives in Rn, multiple integrals, first and second order differential equations.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>45%</td></tr>
<tr><td>Final Test</td><td>√</td><td>35%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>20%</td></tr>
<tr><td>Laboratory Work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides and LCD projectors, blackboards</td></tr>
<tr><td>Reading list</td><td>1. Thomas, Calculus, Pearson Education, 2010, 12th Ed
2. James Stewart, Calculus, Brooks/Cole Publishing Company, 1999, 4th Ed.
3. Dale Varberg, Edwin Purcel and Steve Rigdon, Calculus, Prentice Hall, 2007, 9th Ed.</td></tr>
</table>

8. Elementary Physics IIA

Module designation	Elementary Physics IIA
Module level	Bachelor
Code, if applicable	FI1201
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	First Year
Semester(s) in which module is taught	Eight Semester / Fourth Year
Module coordinator(s)	Dr. Enjang J. Mustopha
Lecturer(s)	Dr. Enjang J. Mustopha
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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>4 hours</td></tr>
<tr><td>Tutorial session</td><td>3 hours</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>2 hours</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>12 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>192 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>4</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr>
<td>• Understanding the basic concepts and principles in electromagnetism and modern physics.</td>
<td>• Able to demonstrate an ability to conduct experiments in measuring the magnitude of magnetic fields inside a solenoid.
• Able to demonstrate an ability to conduct experiments in measuring effective current and potential of an alternating current (AC).
• Able to use ampere meter and voltmeter on a direct current (DC) source and able to analyze the Wheatstone bridge.
• Able to demonstrate an ability to conduct experiments in an interference and diffractions.</td>
<td>• Possess the ability to compute the Coulomb force and electric field generated by discrete and continuous charges, including the application of Gauss's law.
• Possess the ability to compute potential energy and electric potential due to discrete and continuous charges and apply it on capacitors.
• Possess the ability to compute the magnetic field generated by a current-carrying wire (Biot-Savart law and Ampere law).
• Possess the ability to apply the Faraday and Lenz's law of magnetic induction to generate electromotive Force (EMF).
• Possess the ability to solve direct current (DC) and alternating current (AC) problems.
• Possess the ability to explain the quantities of electromagnetic waves, wave energy, wave power and wave intensity.
• Possess the ability to solve problems on interference pattern of N-slit and the diffraction pattern for width-slit and N-slit (interferential-diffraction).</td>
</tr>
</table>
</td></tr>
</table>

		• Possess the ability to solve problems on Einstein's special relativity and wave- particle dualism. • Possess the ability to analyze an experiment of modern Physics (photoelectric effect). • Possess the ability to design a simple device that uses the concepts of Elementary Physics IIA (RBL).

Content	Electrostatic (electric field, Coulomb Law), Electric Potential Energy, Electrical Potential, Capacitor. Magnetism, Electromotive force , Alternating Current, Electromagnetic Wave, Modern Physics, Atomic Physics
Study and examination requirements and forms of examination	

Midterm test	√	30%
Final Test	√	30%
Presentation, quizzes, homework	√	10%
Laboratory work	-	20%

Media employed	Slides and LCD projectors, blackboards, lab
Reading list	1. Halliday, D., Resnick, R., and Walker, J., Principle of Physics, 9th ed. Extended, John Wiley & Sons, 2011. 2. Serway, R.A., Physics for Scientists and Engineers. Sander College, 1996. 3. Alonso, M. & Finn, E.J. Physics. Addison Wesley, 1992.

9. General Chemistry IIA

Module designation	General Chemistry IIA
Module level	Bachelor
Code, if applicable	KI1201
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	General Chemistry IIA
Semester(s) in which module is taught	First Year
Module coordinator(s)	Dr. Bambang Prijamboedi
Lecturer(s)	Dr. Bambang Prijamboedi
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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>4 hours</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>10 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>160 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr>
<td>• Understanding the formation of solution and heat of solution, solubility, Henry’s law, concentration units, colligative properties.
• Understanding the factors that affect reaction rates, rate laws and integrated laws, mechanism of reaction.
• Understanding the laws of equilibrium and Le Chatelier principles.
• Understanding the acid-base properties of a molecule.
• Understanding the pH concept, equilibrium properties of acid-base in solution and principles of acid-base titration.
• Identify the solubility of various compound and understand the selective precipitation.
• Understanding the galvanic cell, electrolysis cell, concept of reduction potential and practical application of electrochemistry.</td>
<td>• Able to use and converse various concentration units.
• Able to determine the reaction mechanism.
• Able to determine equilibrium constant and concentration at equilibria.
• Able to determine the strength of acid and base compounds, concentration at equilibria state and using acid-base titration methods.
• Able to determine the solubility of various compound and use selective precipitation principle to separate various ions and compounds.
• Able to use electrochemical properties of compounds to obtain electrical energy and to</td>
<td>• Possess an extensive knowledge to describe the interaction among the molecules that form solution and use it to predict the properties of solution.
• Possess an extensive knowledge to describe the rate laws and construct the mechanism of reactions.
• Possess an extensive knowledge to describe the nature of acid-base properties and determine the acidity or basicity of a compound.
• Possess an extensive knowledge to describe the use of oxidation and reduction properties of atoms and compounds explain the change of compound connected with the electron movements.
• Possess an extensive knowledge to describe the reason of the nuclear instability and activities.</td>
</tr>
</table>
</td></tr>
</table>

• Understanding the concept of nuclear binding energy, nuclear instability and radiation. • Identify the organic and biochemistry compounds, polymers, nucleic acid.	modify some materials properties. • Able to determine the unstable nuclei and the radiation types that were emitted from unstable nuclear. • Able to identify various organic and biochemical compound.	• Possess an extensive knowledge to describe the reason of the properties of organic and biochemical compounds from its structural properties

Content	Physical properties of solution, Chemical equilibrium, Molecular concept of acid and base, Acid-base equilibria, Solubility and simultaneous equilibria, Electrochemistry, Nuclear chemistry, Organic and biochemical chemistry
Study and examination requirements and forms of examination	Midterm test — 40% Final Test — 40% Attendance, quizzes, homework — 10% Laboratory work — 10%
Media employed	Slides, Beamer, boards, internet, exercises, laboratory.
Reading list	1. James E. Brady, Neil D. Jespersen and Alison Hyslop, Chemistry 6th Edition, John Wiley and Sons, 2012. 2. Raymond Chang, Chemistry 10th Edition, McGraw-Hill, 2010.

10. Scientific Writing

Module designation	Scientific Writing
Module level	Bachelor
Code, if applicable	KU1011
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Scientific Writing
Semester(s) in which module is taught	First Year
Module coordinator(s)	Dr. Asep Wawan Jatmika
Lecturer(s)	Dr. Asep Wawan Jatmika
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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>2 hours</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>2 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding on how to make cohesive and coherent paragraphs.
• Understanding the grammar and appropriate punctuations identification.
• Understanding parts of essay and paper identification.</td><td>• Able to use appropriate word choice.
• Able to arrange sentences correctly.
• Able to develop ideas in various ways.
• Able to compose an academic article.</td><td>• Possess the ability to write a scientific paper in bahasa Indonesia.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Spelling, capitalization, loan translation, and use of punctuation; word formation and use of word formation in sentences; basic sentence patterns, effective sentences, and sentence variation; terminologies, definitions, and syllogisms; conditions, kinds, developments of paragraphs; selection of topics, themes, titles, and outlining; introductory chapter, issues, analysis, and conclusions; initial complementation and final complementation; typing, citations, and references</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>40%</td></tr>
<tr><td>Final Test</td><td>√</td><td>40%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>20%</td></tr>
<tr><td>Laboratory Work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, boards, online communication, internet, exercises</td></tr>
</table>

Reading list	1. Alwi Hasan.et.al. Tata Bahasa Baku Bahasa Indonesia. Jakarta : Balai Pustaka, 1998. 2. Depdikbud. RI. Kamus Umum Bahasa Indonesia Jakarta ; Balai Pustaka. 2000. 3. Keraf, Gorys, Komposisi. Ende Flores : Nusa Indah 1998 4. Sosio Komunikasi, KK Ilmu Kemanusiaan, FSRD-ITB 2006 Metode Penulisan Ipteks. Bandung Penerbit ITB. 5. Peraturan Menteri Pendidikan Nasional RI no. 46 tahun 2009. Pedoman Umum Bahasa Indonesia yang Dieempurnakan. 6. Depdiknas RI. Keputusan Menteri Pendidikan Nasional no. 146/U/2004 tgl 12 Nov 2004.Pedoman Umum Pembentukan Istilah.

11. Sports

Module designation	Sport
Module level	Bachelor
Code, if applicable	KU1001
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Sport
Semester(s) in which module is taught	First Year
Module coordinator(s)	Samsul Bahri, Drs., M.Kes.
Lecturer(s)	Samsul Bahri, Drs., M.Kes.
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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>2 hours</td></tr>
<tr><td>Individual studies</td><td>2 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding positive values of the sport</td><td>• Able to keep their health and able to apply the values in campus and society.</td><td>• Possess an extensive knowledge to describe the importance of sports.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>The course includes the theory and practice. The theory involves the importance of sports, the body fitness, nutrition, sports and the principles of training and various games of sport. The Practice includes the physical exercise</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>45%</td></tr>
<tr><td>Final Test</td><td>√</td><td>35%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>20%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>In class and outdoor-gymnasium class</td></tr>
<tr><td>Reading list</td><td>
1. Bompa, T.O., 1994, Theory and Methodology of Training, Iowa: Kendal/Hunt Publishing Company.
2. Daniel Goleman, 1977, Emotional Intellegence, Jakarta: PT. Gramedia.Pustaka (Indonesian version).
3. Giriwijoyo, S., Y.S. dkk., 2005, Manusia dan Olahraga, ITB - FPOK UPI Bandung, Penerbit ITB.
4. Harsono, 1988, Coaching dan Aspek-asapek Psikologis dalam Coaching, CV. Tambak Kusuma.Pustaka.
5. Snow Harrison, 1992, the Power of Team Building, San Diego, California: Pfeiffer & Company.
6. Willmore, H., Jack & Costill, L., David., 1999, Physiology of Sport and Health Exercise
</td></tr>
</table>

12. Introduction to Engineering & Design

Module designation	Introduction to Engineering & Design
Module level	Bachelor
Code, if applicable	KU1202
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Introduction to Engineering & Design
Semester(s) in which module is taught	First Year
Module coordinator(s)	Dr. Taufiq Mulyanto, S.T.
Lecturer(s)	Dr. Taufiq Mulyanto, S.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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding the engineering design process.
• Understanding the significance of design requirements.
• Understanding the importance of teamwork in engineering project.</td><td>• Able to relate and apply mathematics and basic sciences to simple engineering problem.
• Able to employ tools and determined materials to fulfill a specific design requirements.</td><td>• Possess an extensive knowledge to describe engineering design process to solve simple engineering problem</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Class orientation and team preparation, student team activities: problem definition and formulation, propose alternative solution and conceptual design, experiment/implementation of design solution, evaluation of design solution</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>Students are considered to be competent and pass if the team completed the task under designated criteria. Final grade is scaled to the degree of accomplishments to design criteria</td></tr>
<tr><td>Media employed</td><td>Slides, Beamer, boards, computer lab</td></tr>
<tr><td>Reading list</td><td>1. Philip Kosky et al., Exploring Engineering: An Introduction to Engineering and Design, Academic Press, 2010 (main textbook).
2. Saeed Moaveni, Engineering Fundamentals: An Introduction to Engineering, Cengage Learning, 2011.
3. Holtzapple & Reece, Foundations of Engineering, McGraw-Hill, 2003.</td></tr>
</table>

13. Physical Geology

Module designation	Physical Geology
Module level	Bachelor
Code, if applicable	GL2111
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Physical Geology
Semester(s) in which module is taught	Third Semester / Second Year
Module coordinator(s)	Alfend Rudyawan
Lecturer(s)	Alfend Rudyawan, Reynaldy Fifariz, Meli Hadiana
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 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.	√

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>3 hours</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>3 hours</td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding the objective is giving the student to recognize the mayor geology feature, and could describe, explain, and process the feature.</td><td>• Able to describe the mayor rocks and mineral</td><td>• Understanding the objective is giving the student to recognize the mayor geology feature, and could describe, explain, and process the feature.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Physical geology is a science which study earth processes, planetary science and internal structure of the earth, rocks and minerals, surficial processes such erosion and disintegration, sedimentation, transport mechanism such as rivers, beaches as well as eonian. Earth quakes and tectonics processes, volcanism and internal deformation of the earth covers in this course. Study of energy and mineral resources as well as nature hazard include and describe in this course</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>40%</td><td rowspan="3">60%</td></tr>
<tr><td>Final Test</td><td>√</td><td>50%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>10%</td></tr>
<tr><td>Laboratory work</td><td>√</td><td></td><td>40%</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, white/black-boards, online based platform, internet, exercises, lab specimen, etc.</td></tr>
<tr><td>Reading list</td><td>1. Smith and Pun, 2006, Earthworks, Prentice Hall (Main Reference).
2. Tarbuck and Lutgens, 2000, Earth Science, Prentice Hall.
3. Hamblin, 1989, The Earth Dynamic System, McMilan.</td></tr>
</table>

14. Pancasila and Civic Education

Module designation	Civic Education
Module level	Bachelor
Code, if applicable	KU2071
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Civic Education
Semester(s) in which module is taught	Fifth Semester / Third Year
Module coordinator(s)	Dr. Prima Rosa, M.Ed
Lecturer(s)	Dr. Prima Rosa, M.Ed
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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>84 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Enhance nationalism.
• Have motivation to be a good citizen.
• Commit to implement the Five Principles as the philosophy of nation in social lives.
• Commit to build a good governance.
• Respect and obey the laws and human right.
• Actively participate in socializing democracy</td><td>• Able to describe the nationalism.
• Able to describe how to be a good citizen.</td><td>• Possesses an extensive knowledge to describe nationalism and how to be a good citizen</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>(1). Pancasila as philosophy and the grounded of Indonesian state (2). National identity (3). Politic and strategy (4). The autonomy area (5). The good and clean governance (6). The culture of democracy (7). The civil society (8). Supreme laws (9) The declaration of Human Right (10). Geopolitics (11). Geostrategic</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>35%</td></tr>
<tr><td>Presentation, quizzes, homework</td><td>√</td><td>35%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, Beamer, boards, internet, exercises, workstation</td></tr>
</table>

Reading list	1. Pendidikan Kewarganegaraan: Paradigma Terbaru untuk Mahasiswa, Alfabeta, Bandung, 2010. 2. Ubaidillah dan Abdul Razaq, Pancasila, Demokrasi, HAM dan Masyarakat Madani, Prenada Media Group, Jakarta, 2012. 3. Affan Gaffar, Politik Indonesia: Transisi Menuju Demokrasi, Pustaka Pelajar Offset, Yogjakarta, 2000. 4. Kaelan, Pendidikan Kewarganegaraan Untuk Mahasiswa, Pustaka Pelajar, Yogyakarta, 2011. *5.* Kaelan, Negara Kebangsaan Pancasila; Kultural, Historis, Filosofis, Yuridis, dan Aktualisasinya, Paradigma, Yogyakarta, 2013.

15. Geomathematics 1

Module designation	Geomathematics 1
Module level	Bachelor
Code, if applicable	TG2101
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Geomathematics 1
Semester(s) in which module is taught	Third Semester Semester / Second Year
Module coordinator(s)	Dr. Tedy Setiawan
Lecturer(s)	Ignatius Sonny Winardhie PhD, Dr. Tedy Setiawan
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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>3 hours</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>1. MA1101 Mathematics IA.
2. MA1201 Mathematics IIA.</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr>
<td>• Understanding series, matrix and linear algebra, complex numbers. Partial differential, multiple integral, curl, divergence, and stokes theorem.
• Understanding complex number and applications
• Understanding divergence, curl, and stokes theorem</td>
<td>• Able to do series, convergence test.
• Able to solve matrix and linear algebra.
• Able to solve multiple integral.
• Able to solve simple partial differential equations.</td>
<td>• Possess an extensive knowledge of using convergence test in series.
• Possess an extensive knowledge of using complex numbers and applications.
• Possess an extensive knowledge of using complex numbers and applications.
• Possess an extensive knowledge of solving linear algebra for simple modeling system.
• Possess an extensive knowledge of solving simple physics problems described as 1st or 2nd order ordinary differential equations.
• Possess an extensive knowledge of solving simple physics problems described as partial differential equations.
• Possess an extensive knowledge of using stokes theorem for applications in simple geophysics problem.</td>
</tr>
</table>
</td></tr>
</table>

<table>
<tr><td>Content</td><td>Series: geometric series, convergence test, power series, expanding functions in power series; Complex numbers: real and imaginary parts, complex algebra, Euler’s formula, functions of trigonometric, exponential, hyperbolic and logarithm; Linear algebra: matrices, row reductions, determinant, vector, lines and planes, matrix operations; Partial differential: power series in two variables, total differential, chain rule, implicit differential, change of variables; Multiple integral: double and triple integrals, change of variables, surface integrals; Vector analysis: directional derivative, divergence theorem, curl and Stokes theorem</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>40%</td></tr>
<tr><td>Presentation, quizzes, homework</td><td>√</td><td>30%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, boards, appropriate software, online communication, internet, exercises</td></tr>
<tr><td>Reading list</td><td>1. Mary L. Boas, Mathematical Method in the Physical Sciences, John Wiley & Sons, Third Edition, 2006.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, Inc. Ninth Edition, 2006.</td></tr>
</table>

16. Wave in Geophysics

Module designation	Wave in Geophysics
Module level	Bachelor
Code, if applicable	TG2102
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Wave in Geophysics
Semester(s) in which module is taught	Fourth Semester / Second Year
Module coordinator(s)	Afnimar, Ph.D.
Lecturer(s)	Afnimar, Ph.D., Dr. Tedi Yudistira, S.Si.,M.Si., Dr.rer.nat. Andri Hendriyana, ST.,MT., Dr. Fernando Lawrens, 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 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 material.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>3 hours</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>1. FI1101 Physics IA.
2. FI1201 Physics IIA.</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding physics of transversal waves on a string.
• Understanding the seismic waves formulation.
• Understanding propagation of electromagnetic waves in the earth.</td><td>• Able to understand the wave characteristics on a string and their relation to more complex waves.
• Able to understand many phenomena of seismic wave propagation related to the subsurface structure.
• Able to understand some phenomena of electromagnetic wave.</td><td>• Possess the ability on bring the wave characteristics on a string to seismic and electromagnetic waves.
• Possess the ability on distinguish the particle oscillation between P and S waves.
• Possess the ability on determine the seismic wave phenomena such as reflection, diffraction, attenuation etc., due to subsurface structure.
• Possess the ability on distinguish the oscillation between seismic and electromagnetic waves.
• Possess the ability on identify the electromagnetic wave reflection characters related to recording responses.</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td>Content</td><td>Introduction: Transversal waves on a string: formulation, solution, interference, energy, reflection and transmission; Elastic waves: stress and strain, constitutive relation, elastic wave equation, potential equation; Plane wave: plane wave equation, reflection and transmission of plane waves; Surface waves: Rayleigh wave, Love wave, geometrical dispersion; Ray tracing: Fermat principle, Eikonal equation, transport equation; Diffraction: Huygens principle, exploding reflector; Attenuation: attenuation basic principle, physical dispersion; Wave solution from a double-couple point source: near field, middle field, and far field solutions and their characteristics; Electromagnetic (EM) wave: Maxwell law, EM wave equations, plane wave solution of EM waves, reflection and transmission of EM waves</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td><table>
<tr><td>Midterm test</td><td>√</td><td>40%</td></tr>
<tr><td>Final Test</td><td>√</td><td>40%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>20%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table></td></tr>
<tr><td>Media employed</td><td>Slides, beamer, boards, internet, exercises, etc.</td></tr>
<tr><td>Reading list</td><td>1. M. O. Tjia, Gelombang, Dabara Publishers, 1994.
2. S. Stein & M. Wysession, An Introduction to Seismology, Earthquakes and Earth Structure, Blackwell Publishing, 2003.
3. T. Lay & T. C. Wallace, Modern Global Seismology, Academic Press, 1995.</td></tr>
</table>

17. Basic Geophysics

Module designation	Introduction to Geophysics
Module level	Bachelor
Code, if applicable	TG2103
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Introduction to Geophysics
Semester(s) in which module is taught	Third Semester / Second Year
Module coordinator(s)	Prof. Satria Bijaksana
Lecturer(s)	Prof. Satria Bijaksana, Prof. Djoko Santoso, Dr. Fatkhan, Silvia Jannatul Fajar, M.T., Dr. Shindy Rosalia, Faridz Nizar A., 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 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 material.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>1 hour</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding earth structure, earthquake, concept of plate tectonics and exploration geophysics</td><td>• Able to do basic seismic modeling
• Able to do basic experiment to understand physical properties in geophysics</td><td>• Possess an extensive knowledge of the geophysical methods concepts.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>The course is intended to cover physical parameters and earth interior structures based on geophysical methods. Students are expected to know how to obtain physical parameter and earth interior structures based on geophysical methods</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>40%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>-</td></tr>
<tr><td>Laboratory work</td><td>√</td><td>30%</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Whiteboard, laptop/computer, presentation slides, video &animation, andinternet</td></tr>
<tr><td>Reading list</td><td>
1. Butler, R.F., Paleomagnetism: Magnetic Domains to Geologic Terranes, Blackwell Scientific, 1992.
2. Fowler, C.M.R., the Solid Earth. Cambridge University Press (2nd edition), 2005.
3. Kearey, P., dan F.J. Vine, Global Tectonics. Blackwell Scientific Publications, 1990.
4. Ludman, A., dan N.K. Coch, Physical Geology, McGraw-Hill, Inc., 1982.
5. Plummer, C.C., D. McGeary, dan D.H. Carlson, Physical Geology, McGraw-Hill, Inc., 2001.
</td></tr>
</table>

6. Geophysical Instrumentation

Module designation	Geophysical Instrumentation
Module level	Bachelor
Code, if applicable	TG2104
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Geophysical Instrumentation
Semester(s) in which module is taught	Third Semester / Second Year
Module coordinator(s)	Dr. Tedy Setiawan
Lecturer(s)	Dr. Tedy Setiawan, Dr. Warsa
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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>1 hours</td></tr>
<tr><td>Supervision and consultation</td><td></td></tr>
<tr><td>Practical or experimental laboratory work</td><td>2 hours</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td></td></tr>
<tr><td>Class project</td><td></td></tr>
<tr><td>Field trip</td><td></td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td></td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding the use of electric circuit including series and parallel circuits and op-amp
• Understanding concept of signal processing
• Understanding characteristic of electronical instrumentation
• Understanding the use of sensor and transducer</td><td>• Able to operating series and parallel circuits
• Familiar in reconstructing sensor, transducer and connect with microcontroller
• Able to deliver concept of basic electronical instrumentation and signal processing</td><td>• Possess an extensive knowledge of using electrical circuit.
• Possess an extensive knowledge of using sensor transducer and its application’
• Familiar with signal processing and basic of electronical instrumentation</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Basic configuration of instrumentation system, instrumentation characteristics, components of instrumentation, properties of electronic instrumentation. Examples of electronic instrumentation platform for recently geophysical application and future development.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>35%</td></tr>
<tr><td>Final Test</td><td>√</td><td>45%</td></tr>
<tr><td>Presentation, quizzes, homework</td><td>√</td><td>20%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Conventional lectures using whiteboard, computer, etc., computer exercises, video courses from internet, etc.</td></tr>
<tr><td>Reading list</td><td>1. Webster, Medical Instrumentation: Application and Design, Houghton Mifflin Company, 1996
2. Jacon Fraden, Handbook of modern sensor: Physics, Design and Applications, , AIP press, Springer-Verlag, New York, 1996
3. Rangan, Sarma, Mani, Instrumentation: Devide and System, Tata Mc. Graw-Hill, 1992</td></tr>
</table>

7. Computing in Geophysics

Module designation	Geophysical Computation
Module level	Bachelor
Code, if applicable	TG2105
Sub-heading, if applicable:	
Courses included in the module, if applicable:	Geophysical Computation
Semester(s) in which module is taught	Fourth Semester / Second Year
Module coordinator(s)	Dr. Darharta Dahrin
Lecturer(s)	Dr. Darharta Dahrin, Dr. Setianingsih, Dr. Indra Gunawan
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 turns.	-
Class project 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>3 hours</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>1. MA1101 Mathematics IA.
2. MA1201 Mathematics IIA.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding numerical approach and software utilization</td><td>• Able to do data processing and modelling in geophysical exploration
• Able to create and refine simple program in computation</td><td>• Possess the ability on data processing and geophysical modelling in computation.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Introduction, programming and modeling in geophysics: 1. Mathematical model, 2. Computer, 3. Algorithm, 4 Program, 5. Error analysis, 6. Data processing and modeling in geophysics, linear equation in geophysics problem, 1. Matrix, 2. Matrix inverse, decomposition LU, Gauss Seidel, etc. Curve fitting for analysis and presentation of geophysical data, least squares regression, interpolation and approximation: 1. Linear and polynomial regression, 2. Newton interpolating polynomials, 3. Spline interpolation. Numerical differentiation and integration: 1. Numerical differentiation, 2. Newton-cotes integration formulas, partial differential equation for potential geophysics (gravity, magnetics, geoelectrics, heat, etc.): finite difference, finite element. Optimization</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>35%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>10%</td></tr>
<tr><td>Laboratory work</td><td>√</td><td>25%</td></tr>
</table>
</td></tr>
</table>

Media employed	Slides, beamer, whiteboards, appropriate software, online communication, onlne/internet based platform, etc.
Reading list	1. Chapra, S.C. and Canale, R.P., Numerical Methods for Engineering, 5th Ed., McGraw Hill, 2006. 2. Press, W.H., Flannery, B.P., Teukolsky, S.A., Vetterling, W.T. Numerical Recipes. Cambridge University Press, 1986. 3. O'Brien, S.K., Nameroff, S. Turbo Pascal 7:The Complete Reference. Mc. Graw-Hill, 1993. 4. Blakely, R.J., Potential Theory in Gravity & Magnetic Applications, Cambridge Univ. Press, 1996. 5. Parasnis, D.S. Applied Geophysics. Cambridge University Press, 1981.

8. Introduction on Surveying

Module designation	Introduction on Surveying
Module level	Bachelor
Code, if applicable	GD2001
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Introduction on Surveying
Semester(s) in which module is taught	Fourth Semester / Second Year
Module coordinator(s)	Dr. Hasanudin Z. Abidin
Lecturer(s)	Rizqi Abdulharis, Andri Hernandi, Alfita Puspa Handayani, Ratri Widyastuti, Dwi Wisayantono, Fickrie Muhammad
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 turns.	-
Class project 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding diverse mapping coordinate system, topographical mapping and shake-out</td><td>• Able to process large-scale mapping, as well as reading and interpreting information on maps and utilizing them for various purposes.</td><td>• Possess the ability on processing, reading, and interpreting the mapping.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Map and Function of Map; Geographic Object Position and Coordinate System; Horizontal and Vertical Positioning; Horizontal Positioning Methods; Angle and Distance Measurement; Vertical Positioning Method; Profile; Large-Scale Mapping; Area and Volume Calculation; Map and Image Interpretation; Planning Map; Stake-Out; Review Position and Positioning</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>35%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>35%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, whiteboards, appropriate software, online communication, online/internet based platform, etc.</td></tr>
<tr><td>Reading list</td><td>-</td></tr>
</table>

9. Introduction to Mineralogy and Petrology

Module designation	Introduction to Mineralogy and Petrology
Module level	Bachelor
Code, if applicable	GL2141
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Crystallography and Mineralogy
Semester(s) in which module is taught	Third Semester / Second Year
Module coordinator(s)	I Gusti Bagus Eddy Sucipta
Lecturer(s)	I Gusti Bagus Eddy Sucipta
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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>3 hours</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>23. GL 2111 Physical Geology</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding the objective is giving to student, how the nature of ordering physical and chemical bond and its appearance in crystal form; besides the student should identify “wooden“ideal crystal in sterodiagram. The lecturer explain, how to identify mineral and its physical character in nature, its association in rocks of pyroclastic, sedimentary, metamorphic, gemstone, and the alteration.</td><td>• Able to the identification of crystal form through wooden "ideal crystal"
• Able to recognize crystal and mineral in ideal rock</td><td>• Possess the ability on identifying Crystal and mineral for rocks by its identity and its character</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>The lecture examines the crystal axes and its projection to know the crystal system on the ideal minerals, included the symmetry elements of crystal, repetition, growth-twinning pattern, physical and chemical character for minerals identification. The lecture also explains mineral association to form igneous, pyroclastic, sedimentary and metamorphic rocks, as well as mineral association in economic deposits and gemstones</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>40%</td><td rowspan="3">60%</td></tr>
<tr><td>Final Test</td><td>√</td><td>50%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>10%</td></tr>
<tr><td>Laboratory work</td><td>√</td><td></td><td>40%</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, white/black-boards, online based platform, internet, exercises, lab specimen, etc.</td></tr>
</table>

Reading list	1. Bonewitz RL, 2005, Rocks and Gems, the definitive guide to rocks, minerals, gems and fossils, DK Publishing, New YorkUSA, 360p. 2. Chang R., 1998, Chemistry, sixth edisions, WCB McGraw Hill, New York USA, 993p. 3. Jensen ML & Bateman AM, 1981, Economic Mineral Deposits, John Willey and Sons Inc., New York USA, 589p. 4. Klein C. & Hulburt CS., 1993, Manual of Mineralogy, Jhon Willey and Sons Inc., New York USA, 681p. 5. Klein C., 1989, Minerals and Rocks: Exercises in Crystallography, Mineralogy and Hand-Specimen Petrology, John Willey and Sons Inc., New YorkUSA, 402p. 6. Philips WJ & Philips N, 1980, An Introduction to Mineralogy for Geologists, John Willey and Sons Inc., New York USA, 352p. 7. Rose A.W., Hawkes H.E & Webb J.S., 1979, Geochemistry in Mineral Exploration, Academic Press, London, UK.

10. Religion and Ethics (Islamic)

Module designation	Religion & Ethics (Islamic)
Module level	Bachelor
Code, if applicable	KU2061
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Religion & Ethics
Semester(s) in which module is taught	Fourth Semester / Second Year
Module coordinator(s)	Dr. Asep Zaenal Ausop, M.Ag.
Lecturer(s)	Dr. Asep Zaenal Ausop, M.Ag.
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 turns.	-
Class project 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding Islamic teachings.
• Believing the truth of Islam.
• Improving the faith on Islam.</td><td></td><td>• Implementing the ethics on daily life.
• Improving behavior on social life.
• Implementing good relation to human beings.
• Implementing Islamic values on any activities.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>1). The relationship between the natural laws and religion laws (2). The standing position and the function of human being (3). The holistic of Islam (4). Alqur'an as the first reference of Islam (5). Al-Sunnah as the second of Islam references (6). Ijtihad: the methodology of Islamic justice laws (7). The ethics toward Allah and his messenger (8). The function of ritual (9). The ethics of human relationship (10). The ethic of science, technology and art development (11). The Ethics of politic activities (12). Madany Society/ Civil Society (13). The principles of Islamic banking</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>30%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>40%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, boards, visualizers, online communication, internet, exercises</td></tr>
</table>

Reading list	1. Quraisy Shihab, Tafsir Al-Misbah: Pesan, Kesan dan Keserasian Alqur'an, Lentera Hati, Ciputat Tangerang, 2002. 2. Miftah Faridl, Pokok-pokok Ajaran Islam, Pustaka Salman ITB, Bandung, 2000. 3. Asep Zaenal Ausop, Quranic Character Building: Mewujudkan Muslim yang Berkarakter Qur'ani, Grafindo, Bandung, 2013. 4. Hamdan Manshur, dkk, Material Insteruksional Pendidikan Agama Islam. 5. untuk Perguruan Tinggi Umum, Direktorat Pendidikan Tinggi Islam, Depag, 2006. 6. Munawar Khalil, Kembali kepada Alqur'an dan Sunnah, Bulan Bintang, Jakarta, 1973. 7. Cecep Alba, Tasawuf dan Tarekat : Dimensi Esoteris Ajaran Islam, Rosda Karya, Bandung, 2012.

11. Geomathematics II

Module designation	Geomathematics II
Module level	Bachelor
Code, if applicable	TG2203
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Geomathematics II
Semester(s) in which module is taught	Fourth Semester / Second Year
Module coordinator(s)	Prof. Satria Bijaksana
Lecturer(s)	Prof. Dr. Satria Bijaksana, Silvia Jannatul Fajar ST,MT, Dr. Tedy Setiawan, Dr. Shindy Rosalia S.T., M.T., Dr. Tedi Yudistira, S.Si.,M.Si., Dr.rer.nat. Andri Hendriyana, 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 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 material.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>3 hours</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>1. MA1101 Mathematics IA.
2. MA1201 Mathematics IIA.
3. TG2101 Geomathematics I.</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding Fourier analyses, Fourier series, and Fourier transform.
• Understanding coordinate transformation, Eigen values, and Eigen vectors.
• Understanding ordinary differential equations.
• Understanding partial differential equations.</td><td>• Able to proficient in using Fourier series and Fourier transform.
• Able to proficient in coordinate transformation.
• Able to solve Eigen value problems.
• Able to solve simple ordinary differential equations.
• Able to solve simple partial differential equations.</td><td>• Possess the ability on using Fourier series and Fourier transform in simple signal analyses.
• Possess the ability on using coordinate transformation as mean to solve simple physics problems.
• Possess the ability on solving simple Eigen value cases such as stress-strain tensor as well as magnetic susceptibility tensor.
• Possess the ability on solving simple physics problems described as 1st or 2nd order ordinary differential equations (spring or pendulum motions, failing object with air friction etc.).
• Possess the ability on solving simple physics problems described as partial differential equations (wave motions in string, thermal diffusion etc.).</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Fourier analysis: Fourier series, complex form of Fourier series, Fourier transformations, Fourier transformation characteristics, introduction of convolution; Coordinate transformations: Cartesian, sphere and cylinder coordinates, linear transformation, eigenvalues, eigenvectors, diagonal matrices and its applications, curvilinear coordinates; Ordinary differential equations: linear first-order equations, second-order linear equations with zero right-hand side, second-order linear equations with right-hand side not zero; Differential partial equations: Laplace's equation: steady-state temperature in a rectangular plate, one dimension diffusion equation, wave equation on a string</td></tr>
</table>

<table>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>40%</td></tr>
<tr><td>Final Test</td><td>√</td><td>40%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>20%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, boards, appropriate software, online communication, internet, exercises, etc.</td></tr>
<tr><td>Reading list</td><td>1. Mary L. Boas, Mathematical Method in the Physical Sciences, John Wiley & Sons, Third Edition, 2006.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, Inc. Ninth Edition, 2006.</td></tr>
</table>

12. Potential Theory

Module designation	Potential Theory
Module level	Bachelor
Code, if applicable	TG2204
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Potential Theory
Semester(s) in which module is taught	Fourth Semester / Second Year
Module coordinator(s)	Dr. Darharta Dahrin
Lecturer(s)	Dr. Darharta Dahrin, MS, Dr. Eko Januari Wahyudi, ST,MT, Dr. Setianingsih, ST,MT, Dr. Indra Gunawan, S.Kom.,M.Si., Prof.Dr. Satria Bijaksana, Faridz Nizar Ahmady, 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 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 material.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>1. MA1101 Mathematics IA.
2. MA1201 Mathematics IIA.
3. TG2014 Geophysical Computation.
4. TG2203 Geomathematics II.</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding vector analyses and vector manipulation.
• Understanding fundamental physics laws related to potential theory (Newton laws, Gauss law, and Ampere law).
• Understanding Laplace and Poisson equations.
• Understanding mathematical formulation of potential theory in geophysics (gravity, magnetic, geo-electricity, electro-magnetism, and temperature/heat).
• Understanding applications of potential theory in geophysics (gravity, magnetic, geo-electricity, electro-magnetism, and temperature/heat).</td><td>• Able to proficient in vector analyses and vector manipulation.
• Able to derive or relating fundamental laws and equations into geophysical method.</td><td>• Possess the ability on using vector analyses and vector manipulation in solving simple geophysics problem.
• Possess the ability on using mathematical tools to derive physical parameters used in geophysical methods.
• Possess the ability on determining appropriate physical parameter for particular geophysical problem.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Introduction, vector analysis, conservative and non-conservative field, green theorem: divergence and stokes theorem, theorems application in potential field: newton, gauss, and ampere law. Field potential in geophysics: gravity, magnetics, geoelectrics, electromagnetics, and heat; laplace and poisson equation, gravity potential analysis: gravity potential and case studies, magnetics potential analysis: magnetics potential and case studies, geoelectrics potential analysis: geoelectrics potential and case studies, heat (temperature) potential analysis: heat potential and cases studies, EM potential analysis: EM potential and case studies. Real case studies</td></tr>
</table>

<table>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>40%</td></tr>
<tr><td>Final Test</td><td>√</td><td>40%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>20%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, whiteboards, appropriate software, online communication, internet, exercises, etc.</td></tr>
<tr><td>Reading list</td><td>

1. Mari L., Boas, Mathematical Methods in the Physical Sciences, 3rd. Ed. John Wiley and Sons, 2006.
2. Blakely, R.J., Potential Theory in Gravity & Magnetic Applications, Cambridge Univ. Press, 1996.
3. Griffiths, D.J., Introduction to Electrodynamics, 3rd ed., Prentice Hall, 1999.
4. Turcotte, D.L., and Schubert, G., Geodynamics, 1982..
5. Telford et.al.Applied Geophysics, Cambridge University Press, 1976.
6. Grant and West, Interpretation Theory in Applied Geophysics, Mc. Graw Hill Book Company, 1965.
7. George Arfken, Mathematical Methods for Physicists, Academic Press Inc., 1985.

</td></tr>
</table>

13. Geostatistics I

Module designation	Geostatistics I
Module level	Bachelor
Code, if applicable	TG2201
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Geostatistics
Semester(s) in which module is taught	Sixth Semester / Third Year
Module coordinator(s)	Dr. Darharta Dahrin
Lecturer(s)	Dr. Darharta Dahrin, MS, Dr. Indra Gunawan, S.Kom.,M.Si., Dr. Warsa S.Si.,MT, Dr. Susanti Alawiyah, ST,MT, Ignatius Sonny Winardhie, Ph.D., Ekkal Dinanto, 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 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 material.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>1 hours</td></tr>
<tr><td>Individual studies</td><td>6 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>1. TG2101 Geomathematics I.
2. TG2111 Introduction to Geophysics.
3. GL2111 Physical Geology.</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Students are able to process geophysical data by using geostatistic and able to optimize it.</td><td>• Process and interpretation geostatistics data</td><td>• Possesses an extensive knowledge to describe the application of geostatistics, optimize it and interpretation geophysical data.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Introduction, elementary statistics: mean, median, modus, variance, standart deviation. Statistics descriptive: Dataset, Chebyshev's inequality, normal datasets. Element of probability: sample space and event, Venn diagram, algebra of events, axioms of probability, Bayes formula. Random variables: Type of random variables, probability distribution. Mathematics Expectation: expectation, variance, covariance, correlation, Chebysev formula. Distribution of sampling statistics: Sample means, central limit theorem, the sample variance, sampling distributions from a normal and a finite population. Parameter estimation: Maximum Likelihood estimator, interval estimates, the Bayes's estimator. Hypothesis testing: Significance levels, the t-test, Chi-test. Regression: Least square estimator of the regression parameters, the coefficient of determination and sample correlation, weighting least square. ANNOVA: One-way analysis of variance, two factor of analysis of variance, Polynomial, Case Study, Reviews.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>45%</td></tr>
<tr><td>Final Test</td><td>√</td><td>35%</td></tr>
<tr><td>Presentation, quizzes, homework</td><td>√</td><td>10%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>10%</td></tr>
</table>
</td></tr>
</table>

Media employed	Slides, beamer, whiteboards, appropriate software, online communication, internet, exercises, etc.
Reading list	1. Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K., 2007, Probability & statistics for Engineers & Scientists, 8th Ed., Pearson Prentice Hall. 2. Davis, J.C., 1986, Statistics and Data Analysis in Geology, 2nd. Ed., John Wiley & Sons. 3. Kelkar, M. And Perez, G., 2002, applied Geostatistics for Reservoir Characterization, SPE Inc. Richardson, Texas. 4. Webster, R. And Oliver, M., 2001, Geostatistics for Environmental scientists, John Wiley & Sons.. 5. McGrew, J. C. And Monroe C.B., 2000, An Introduction to Statistical Problem Solving in Geography, McGraw Hill. 6. Webster, R. And Oliver, M., 2001, Geostatistics for Environmental scientists, John Wiley & Sons.

14. Seismology

Module designation	Seismology
Module level	Bachelor
Code, if applicable	TG2231
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Seismology
Semester(s) in which module is taught	Fifth Semester / Third Year
Module coordinator(s)	Afnimar, PhD
Lecturer(s)	Prof.Dr. Andri Dian Nugraha S.Si.,M.Si., Dr. Zulfakriza, S.Si.,MT, Dr. Afnimar, M.Sc', Dr. Tedi Yudistira, S.Si.,M.Si., Dr. Shindy RosaliaS.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 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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>3 hours</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>TG2205 Wave Theory in Geophysics.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding the seismic waves and their recording on three-component seismometer.
• Understanding the concept of location, source mechanic, and size of an earthquake, and their relation to the plate tectonic.</td><td>• Able to proficient in basic seismogram analysis.
• Able to do basic earthquake location determination.
• Understanding the P wave radiation pattern from a fault model and its relation to the beach-ball of focal mechanism.
• Understanding the basic concept of earthquake size.</td><td>• Possess the ability on determining and analyzing the seismic wave phases recorded on a three-component seismometer.
• Possess the ability on estimating the earthquake location using classical methods, such as wadati diagram, graphic method, basic grid search method and basic inverse gradient method.
• Familiar in reading “beach-ball“ focal mechanism and its relation to faulting parameters.
• Familiar in quantity of magnitude, energy and intensity.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Seismic waves: elasticity theory, wave equations, types of seismic waves; Seismograph: principle of seismograph; Seismological network: types of seismograph network; Seismogram: ray and travel time in a spherical earth and its characteristics, phases of seismic waves from an earthquakes; Hypocenter: determination methods of hypocenter; Focal Mechanism: elastic rebound theory: faults and first motions, P wave radiation pattern, Stereographic fault plane representations; Modeling of source time function: Haskel line source, directivity, source spectrum; Magnitude: concepts and types of magnitudes; Energy, concept and its determination methods; Intensity: concept and its classifications; Earthquake statistic: frequency-magnitude relations; Seismotectonic: the relation between the previous topics and plate tectonics</td></tr>
</table>

<table>
<tr><td>Study and examination requirements and forms of examination</td><td><table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>30%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>10%</td></tr>
<tr><td>Laboratory work</td><td>√</td><td>30%</td></tr>
</table></td></tr>
<tr><td>Media employed</td><td>Slides, beamer, boards, internet, exercises, etc.</td></tr>
<tr><td>Reading list</td><td>1. Afnimar, Seismologi, edisi pertama, Penerbit ITB, 2009.
2. S. Stein & M. Wysession, An Introduction to Seimology, Eathquakes and Earth Structure, Blackwell Publishing, 2003.
3. T. Lay & T. C. Wallace, Modern Global Seismology, Academic Press, 1995.</td></tr>
</table>

15. Structural Geology

Module designation	Structural Geology
Module level	Bachelor
Code, if applicable	GL 2012
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Structural Geology
Semester(s) in which module is taught	Fourth Semester / Second Year
Module coordinator(s)	Ir. Benyamin Sapiie, Ph.D
Lecturer(s)	Indra Gunawan, Alfend Rudyawan, Benyamin Sapiie, Chalid Idham Abdullah
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. 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>3 hours</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>GL2251 Principle of Stratigraphy
GL2242 Geomorphology
GL2103 Petrology</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding the element of geological structure with an important kinematic and dynamic analysis.
• Understanding the concept of synthetic analysis from tectonic process related to its structure development.</td><td>• Able to identify major structure element through compass data (fault, fracture, lineament, folding).
• Able to make a description and analysis of the structure.</td><td>• Possess an extensive knowledge of kinematic analysis from the structure element.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Structural geology is study of deformed rocks including shape, geometry and architecture of the crust as well as their deformation mechanism. Structural geology includes understanding tectonic deformation such as force, stress and strain. Identifying, mapping and analyzing various different structures such as fractures, folds, faults, foliation, section and lineation and their relationship among them in the context of plate tectonic. Applying structural geology techniques in analyzing geological natural disaster in active tectonic regions including earthquakes and landslides, hydrocarbon migration and trap, economic minerals and engineering geology.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>30%</td></tr>
<tr><td>Presentation, quizzes, homework</td><td>√</td><td>40%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, Beamer, boards, internet, exercises, workstation</td></tr>
</table>

Reading list	1. Davis, G. H., Reynolds, S. J., and Kluth, C. F., 2012, Structural Geology of Rock and. Regions: 3rd edition, John and Wiley and Sons, Inc., 835 p. (Main Source) 2. Fossen, H., 2010, Structural Geology, Cambrige University Press. 463 p. (Main Source) 3. Twiss, R. J. and Moore, E. M., 1992, Structural Geology: W. H. Freeman and Company, 532 .p. 4. Marshak and Mitra, (1988), Basic Methods of Structural Geology, Prentice-Hall, 441.

16. Sedimentology and Stratigraphy

Module designation	Sedimentology and Stratigraphy
Module level	Bachelor
Code, if applicable	GL3053
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Sedimentology
Semester(s) in which module is taught	Third Semester / Second Year
Module coordinator(s)	Dwiharso Nugroho
Lecturer(s)	1. Dwiharso Nugroho 2. Wahyu Probo Ananto 3. Reynaldy Fifariz 4. Dardji
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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>3 hours</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>32. GL2111 Physical Geology
33. GL2242 Petrology</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding the objective is student understand concept, theory, and basic law for developing sedimentary rock, its transporting, and process either mechanically, chemically or organic.</td><td>• Able to description the mayor sedimentary rocks from sample</td><td>• Understanding the objective is student understand concept, theory, and basic law for developing sedimentary rock, its transporting, and process either mechanically, chemically or organic.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>The course explain about sedimentary particles how it was formed, transported and deposited in term of mechanical, chemical and biological processes. Explaining about where and how sedimentary rocks were deposited and its characteristic. To understand all about sedimentary rocks the course started with sedimentary texture analysis comprising of grain size, grain shape and grain packing. Based on sedimentary texture the sedimentary processes are elaborated; starting with mechanical process of traction and gravity mass flow, in this topic sedimentary structure and its relation to sedimentary processes are discussed. Continue with carbonate sedimentation in which biological process is predominant beside mechanical and chemical, following by the chemical process of evaporitic sediments The course continue with sedimentary rocks classification and depositional analysis. Depositional analysis comprise of continental, transitional, shallow marine and deep marine. The course ended with the economic potential of sedimentary rocks</td></tr>
</table>

<table>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>40%</td><td rowspan="3">60%</td></tr>
<tr><td>Final Test</td><td>√</td><td>50%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>10%</td></tr>
<tr><td>Laboratory work</td><td>√</td><td></td><td>40%</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, white/black-boards, online based platform, internet, exercises, lab specimen, etc.</td></tr>
<tr><td>Reading list</td><td>
1. Friedman, GM., Sanders, JE, 1978, Principles of Sedimentology, John Wiley & Sons Inc.
2. Collinson, JD., Thompson, DB., 1982, Sedimentary Structures 2nd Ed., London Unwin Hyman, 207p.
3. Mc Lane, M., 1995, Sedimentology, Oxford University Press Inc., 423p.
4. Pettijohn, FJ., Potter, PE., 1964, Atlas and Glossary of Primary Sedimentary Structure, Springer-Verlag, Berlin, 370p.
</td></tr>
</table>

29. Geophysical Signal Analysis

Module designation	Geophysical Signal Analysis
Module level	Bachelor
Code, if applicable	TG3110
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Geophysical Signal Analysis
Semester(s) in which module is taught	Fifth Semester / Third Year
Module coordinator(s)	Dr. Alfian
Lecturer(s)	Prof. Wawan Gunawan A. Kadir, Dr. Alfian, Dr. Eko Januari Wahyudi
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 turns.	√
Class project 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>3 hours</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>1. TG2101 Geomathematics I.
2. TG2203 Geomathematics II.
3. TG2205 Wave Theory in Geophysics.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>10. Understanding the basic concepts of geophysical signal analysis, signal classification and noise, linear system theory for continuous functions, sampled data.
11. Understanding the Fourier Transform, transfer function and impulse response of linear systems, Spectral analysis, Convolution and correlation and digital filtering.
12. Understanding the application of digital filtering and deconvolution for geophysical data analysis and processing.</td><td>13. Able to do analysis and synthesis of digital filter for geophysics signal.
14. Able to design digital filter and how to apply to a signal, such as inverse and wave shaping filter.</td><td>15. Possess the ability to explain basic concepts of geophysical signal analysis and its application.
16. Possess the ability on analyzing seismic signal in order to extract the information.
17. Possess the ability on designing an algorithm and computer program of digital filter and apply it to geophysical signal.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Signal: analog signal, digital signal, analog to digital conversion; Fourier transform: Fourier series, Fourier integral, Fourier transform properties, Cosines Fourier transform; Discrete Fourier transform: Fourier coefficient, Fourier integral, FFT: Convolution: convolution in time and frequency domain, convolution properties, mean of convolution, programing; Correlation: definition, cross correlation, auto correlation, correlation theorem; Sampling theory: sample function, sampling theorem, aliasing; phase properties in digital signal, filter</td></tr>
</table>

<table>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>45%</td></tr>
<tr><td>Final Test</td><td>√</td><td>35%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>20%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, whiteboards, appropriate software, online communication, internet, exercises, etc.</td></tr>
<tr><td>Reading list</td><td>1. Oram Brigham B.: The Fast Fourier Transform and It’s Applications. Prentice-Hall Inc., 1988.
2. Clearbout, J.F.; Fundamentals of Geophysical Data Processing With Applications to Petroleum Prospecting. Mc. Graw-Hill Book Co., New York, 1976.
3. Sheriff, R.E., and Geldart, L.P.; Exploration Seismology Vol.2 : Data Processing and Interpretation. Cambridge University Press, 1983.</td></tr>
</table>

30. Geostatistics II

Module designation	Geostatistics II
Module level	Bachelor
Code, if applicable	TG3102
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Geostatistics II
Semester(s) in which module is taught	Fifth Semester / Third Year
Module coordinator(s)	Dr. Darharta Dahrin
Lecturer(s)	Dr. Darharta Dahrin, MS, Indra Gunawan, S.Kom.,M.Si., Dr. Warsa S.Si.,MT, Dr. Susanti Alawiyah, ST,MT, Ignatius Sonny Winardhie, Ph.D., Ekkal Dinanto, 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 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 material.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td></td></tr>
<tr><td>Supervision and consultation</td><td>1 hour</td></tr>
<tr><td>Practical or experimental laboratory work</td><td></td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>6 Hours</td></tr>
<tr><td>Presentation</td><td></td></tr>
<tr><td>Class project</td><td></td></tr>
<tr><td>Field trip</td><td></td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>TG2201 Geostatistics I (Prerequisite)</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Students are able to understand geophysical data and how analyze the data using geostatistics and able to know the results.</td><td>• Student are able to analyze and process the data by geostatistics methods.</td><td>• Possesses an extensive knowledge to describe the application of geostatistics, optimize it and interpretation geophysical data.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Introduction, Uni variable data analysis, Spatial correlation, Estimation and modeling, Kriging Estimation, Linear Kriging, Non Linear Kriging, Application, Conditional Simulation Technique, Grid Based Simulation, Object based simulation, Simulation Technique Based on Facies Geology, Artificial Neural Network, Application.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>35%</td></tr>
<tr><td>Final Test</td><td>√</td><td>45%</td></tr>
<tr><td>Presentation, quizzes, homework</td><td>√</td><td>20%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, whiteboards, appropriate software, online communication, internet, exercises, etc.</td></tr>
<tr><td>Reading list</td><td>1. Davis, J. C, Statistics and Data Analysis in Geology, 2, John Wiley and Sons, 2nd ed, 1986
2. Kelkar, M. And Perez, G, applied Geostatistics for Reservoir Characterization, , SPE Inc. Richardson, Texas, 2002
3. Dubrul, O, Geostatistics for seismic Data Integration in Earth Models, , SEG, 2003</td></tr>
</table>

31. Seismic Refraction

Module designation	Seismic Refraction
Module level	Bachelor
Code, if applicable	TG3109
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Seismic Refraction
Semester(s) in which module is taught	Fifth Semester / Third Year
Module coordinator(s)	Dr. Agus Laesanpura
Lecturer(s)	Dr. Agus Laesanpura, Dr. R. M. RachmatSule
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 turns.	√
Class project 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>3 hours</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>3 hours</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>TG2205 Wave Theory in Geophysics.</td></tr>
<tr><td>Recommended prerequisites</td><td>First year Physic and mathematic</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding wave elastic, acoustic, homogeny and heterogenic; modulus.
• Understanding wave equation and Ray: Eikonal, Snell, Huygen, and Fermat.
• Understanding the depth and interface calculation background: simple, inclined, undulating, finer result by cross hole, transmission, and basic tomography.
• Understanding object study refraction: Field of study, technique; Application.
• Understanding wave equation and simulation on linux based</td><td>• Able to do depth calculation through refraction wave.
• Able to picking phase, and interpreting directly or through calculation.
• Able to process data for cross-hole and basic tomography.
• Able to use seismic viewer(SEGY) for picking preparation</td><td>• Possess the ability on acquiring refraction data using suitable exploration instrument.
• Possess the ability on calculation and interpreting refraction data in subsurface.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Introduction: terminologies of elasticity, elasticity parameters, seismic wave theory through elastic medium, solving elastic wave equation, source mechanism, eikonal and transport equations, solving eikonal equation, basic theory of refraction seismic method (Hagiwara and Masuda methods), transmission seismic method, wide-angle seismic method, some applications of refraction seismic, seismic transmission and wide-angle seismic methods for geothechnics, mining, geodynamics, etc</td></tr>
</table>

<table>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>35%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>10%</td></tr>
<tr><td>Laboratory work</td><td>√</td><td>25%</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, whiteboards, appropriate software, online communication, internet, exercises, etc.</td></tr>
<tr><td>Reading list</td><td>

1. Telford et al.; Applied Geophysics, Cambridge University Press, 1976.
2. Taib, M.I.T.; Interpretasi Seismic Refraksi dan Seismologi Teknik, Laboratorium Geoteknik, Pusat Antar Universitas Ilmu Rekayasa-ITB, 1987.
3. Musgrave, A.; Seismic refraction prospecting, Society of Exploration Geophysics, Tulsa, 1986.
4. Cerveny, Ray Theory, Cambridge Univ, Press., 2004.
5. N. Matsuda; Seismic refraction analysis for engineering study, Oyo Technical Notes,1981.
6. Kenneth, H.W.; Refraction Seismologi. John Wiley and Sons, 1988.
7. Sule, M. R., Seismic Travel Time Tomography and Elastic Waveform Modeling, Logos Verlag Berlin, 2004.

</td></tr>
</table>

32. Earth Crust Mechanics

Module designation	Earth Crust Mechanics
Module level	Bachelor
Code, if applicable	TG3132
Sub-heading, if applicable:	
Courses included in the module, if applicable:	Earth Crust Mechanics
Semester(s) in which module is taught	Seventh Semester / Fourth Year
Module coordinator(s)	Dr. Wahyu Triyoso
Lecturer(s)	Dr. T.A. Sanny, Dr. Wahyu Triyoso, Dr. David P. Sahara
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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>1. TG4142 Engineering & Environmental Geophysics.
2. Geo-Technical.
3. Earth Mechanisms.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding main principles of earth crust mechanics and fluid</td><td>• Able to calculate force, stress and strain tensor in rock deformation</td><td>• Possess an extensive knowledge of earth crust mechanics and fluids basic principle and the integration with other geoscience</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>The topics of the lecture are concerned with integrated exercise intimately between explanation of basic principles and its application on physical properties and mechanics of rocks. The main principles of earth crust mechanics and fluid such as classical of earth crust mechanic, geological classification, engineering classification, force and stress, tensors, strain tensor and deformation, rock rheology, viscosity and flows laws, components of velocity gradient, partial movement and stream function, progressive deformation are introduced. A number of application will be introduced on geodynamic framework, tectonic, geological structure, modeling on deformation, rock slope engineering, foundation engineering, soil & rock mechanic technology, nondestructive testing, and determination of elastic parameter for geotechnics, mining, and oil exploration and exploitation.</td></tr>
</table>

<table>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>45%</td></tr>
<tr><td>Final Test</td><td>√</td><td>35%</td></tr>
<tr><td>Quizzes, homework</td><td>√</td><td>20%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides and LCD projectors, whiteboards</td></tr>
<tr><td>Reading list</td><td>

1. Middleton, G, V., R Wilcock P.R., Mechanics in the Earth and Environmental Sciences. Cambridge Univ. Press, 1996.
2. Jaeger, J.C., and N.G.W. Cook, Fundamental of Rock Mechanics. London, Methuen, 1979.
3. Weijermars, R., Principles of Rock Mechanics. Alboran Science Publishing, 1997.
4. ASTM-STP 634, Dynamic Geotechnical Testing. Race-Street, Philadelphia, USA, 1977.
5. Terrawatanachai, R., Non Destructive Testing. Tokyo-Japan, 1998.

</td></tr>
</table>

33. Geophysical Thermodynamics and Fluid Dynamic

Module designation	Geophysical Thermodynamics and Fluid Dynamic
Module level	Bachelor
Code, if applicable	TG3201
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Geophysical Thermodynamics and Fluid Dynamic
Semester(s) in which module is taught	Fifth Semester / Third Year
Module coordinator(s)	Dr.Ir. Agus Laesanpura
Lecturer(s)	Dr.Ir. Agus Laesanpura, MS, Dadi Abdurrahman, ST, MT, Dr. Setianingsih, ST,MT, Dr. Eko Januari Wahyudi, ST,MT
Language	Bahasa Indonesia
Relation to curriculum	Major subject
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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>1 hour</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>7 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>4 hours</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>84 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>TG2101 Geomathematics I.</td></tr>
</table>

Learning Goals

Knowledge	Skill	Competence
• Understand thermodynamic laws (Zeroth law, First law, Second law, and Third law). • Understand thermodynamic coordinates and potential functions. • Understand mineral phase transition and phase diagram. • Understand geothermal in Earth crust; heat flow in oceanic and continental plates; metamorphism. • Understand non dimensional number and modeling prototype • Understand fluid statics. • Understand fluid mechanics.	• Able to manipulating thermodynamic coordinates and potential function for thermodynamic cases in geosciences. • Familiar in reconstructing phase diagram for polymorphs based on standard thermodynamic properties. • Familiar in reconstructing simple geothermal profiles based on thermal conduction equations. • Familiar in using mechanical fluid parameters in simple geosciences cases.	• Possesses manipulating thermodynamic coordinates and potential function for thermodynamic cases in geosciences. • Familiar in reconstructing phase diagram for polymorphs based on standard thermodynamic properties. • Familiar in reconstructing simple geothermal profiles based on thermal conduction equations. • Familiar in using mechanical fluid parameters in simple geosciences cases.

<table>
<tr><td>Content</td><td>Proficient in manipulating thermodynamic coordinates and potential function for thermodynamic cases in geosciences. Familiar in reconstructing phase diagram for polymorphs based on standard thermodynamic properties. Familiar in reconstructing simple geothermal profiles based on thermal conduction equations. Familiar in using mechanical fluid parameters in simple geosciences cases. Proficient in manipulating thermodynamic coordinates and potential function for thermodynamic cases in geosciences. Familiar in reconstructing phase diagram for polymorphs based on standard thermodynamic properties. Familiar in reconstructing simple geothermal profiles based on thermal conduction equations. Familiar in using mechanical fluid parameters in simple geosciences cases</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td><table>
<tr><td>Midterm test</td><td>√</td><td>40%</td></tr>
<tr><td>Final Test</td><td>√</td><td>40%</td></tr>
<tr><td>Presentation, quizzes, homework</td><td>√</td><td>20%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table></td></tr>
<tr><td>Media employed</td><td>Slides, beamer, boards, appropriate software, online communication, internet, exercises etc.</td></tr>
<tr><td>Reading list</td><td>1. Anderson, G.M., Thermodynamics of Natural Systems, John Wiley, 1996.
2. Bar-Meir, G., Basic of Fluid Mechanics, Potto Project (e-book), 2011.
3. Fowler, C. M. R., The Solid Earth: An Introduction to Global Geophysics, 2nd edition Cambridge University, 2004.
4. Kern, R., and Weisbord, A. Thermodynamics for Geologist. Freeman Cooper & Co, 1967.
5. Munson, Young,Okiishi, Fundamentals of Fluid Mechanics, John wiley 2006
6. Zemansky and Dittman. Heat and Thermodynamics. Mc. Graw-Hill, 1982.</td></tr>
</table>

34. Seismic Data Acquisition

Module designation	Seismic Data Acquisition
Module level	Bachelor
Code, if applicable	TG3261
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Seismic Reflection Data Acquisition & Processing
Semester(s) in which module is taught	Sixth Semester / Third Year
Module coordinator(s)	Dr. Alfian
Lecturer(s)	Dr.Eng.Ir. T.A. Sanny, MT, Dr. Alfian, MT, Prof.Dr.rer.nat. Awali Priyono, Fernando Lawrens Hutapea, ST,M, Dr.rer.nat. Andri Hendriyana, 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 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 material.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>3 hours</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>TG2205 Waves Theory in Geophysics.</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Basic exploration seismology, seismic history and technology and terminology.
• Basic theory seismic wave travel time, reflected, refracted waves, ray geometry, Seismic resolution.
• Knowledge of seismic data acquisition, consideration, objectives and limitation, parameter, equipment and technic. Land and marine survey design.
• Knowledge of seismic data processing, seismic velocity, seismic migration.</td><td>• Good understanding and QC of the equipment and technic of land and marine seismic acquisition, survey parameter design.
• Good understanding of 2D seismic data processing technic, and able to process seismic data from raw data to final stack section.
• Good understanding of migration technic in seismic data processing, seismic velocity.
• Familiar with industrial seismic processing system software.</td><td>• Able to explain basic concept of exploration seismology.
• Be able to use Basic knowledge of basic concept of exploration seismology to design and QC of marine and land seismic survey.
• Be able to process seismic data from filed record to stack section.
• Be able to find the best processing flow and parameter for a specific seismic data.
• Be able to QC seismic processing operation of marine and land seismic data using seismic processing system software.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>The topics subject are focused into the following subtopics : review of fundamental concept of reflection seismic and its application of subsurface image reconstruction for oil & gas exploration, time-distance relationship, seismic data acquisition, quality control, 2D Land and Marine seismic survey, Seismic data Processing, seismic migration, seismic velocity and Seismic attribute and DHI</td></tr>
</table>

<table>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>45%</td></tr>
<tr><td>Final Test</td><td>√</td><td>35%</td></tr>
<tr><td>Presentation, quizzes, homework</td><td>√</td><td>20%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, whiteboards, appropriate software, online communication, internet, exercises, etc.
Plus there is also laboratory work. Laboratory sessions are organized in parallel to theoretical study given in classrooms. Students perform different experiments each week and submit reports for evaluation.</td></tr>
<tr><td>Reading list</td><td>1. Yilmaz, O., Seismic Data Processing, Society of Exploration Geophysics, 1987.
2. Sheriff, R.E. & Geldart, L.P. Exploration Seismology. 1998.</td></tr>
</table>

35. Geo-electromagnetism

Module designation	Geo-electromagnetism
Module level	Bachelor
Code, if applicable	TG3241
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	
Semester(s) in which module is taught	Sixth Semester / Third Year
Module coordinator(s)	
Lecturer(s)	18. Dr.rer.nat.Ir. Wahyudi Widyatmoko Parnadi, MS 19. Dr.rer.nat. Widodo ST,MT 20. Dr. Warsa S.Si.,MT 21. 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 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 material.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td></td></tr>
<tr><td>Supervision and consultation</td><td></td></tr>
<tr><td>Practical or experimental laboratory work</td><td>1 hour</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>8 hours</td></tr>
<tr><td>Class project</td><td>48 hours</td></tr>
<tr><td>Field Trip</td><td></td></tr>
<tr><td>Total workload per semester</td><td>70 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>1. TG2101 Geomathematics I (Prerequisite)
2. TG2103 Basic Geophysic (Prerequisite)
3. TG2203 Geomathematics II (Prerequisite)</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understand basic background of geoelectric and electromagnetic Methods.
• Understand current distribution in the scheme homogenous and inhomogeneities concepts.
• Understand the concept of forward and inversion modeling.
• Understand of apparent and true resistivities concept.
• Understand skin depth concept either in the geoelectric and electromagnetic methods
• Understand design surveys of geoelectric and electromagnetic methods.</td><td>• Able to apply geoelectric and electromagnetic methods in order to solve the problem of exploration, environmental and hazard mitigation.
• Understand to modeling the geoelectric and electromagnetic models in the scheme of forward and inversion models.
• Familiar in design survey of geoelectric and electromagnetic methods
• Able to analysis the exploration problem using geoelectric and electromagnetic methods</td><td>• Take possession of capability in order to solve the problem in the case of geophysical exploration.
• Familiar in the modeling of geoelectric and electromagnetic data in the scheme of forward and inversion model.
• Familiar in design survey of geoelectric and electromagnetic methods.
• Familiar to analysis the exploration problem using geoelectric and electromagnetic methods</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td>Content</td><td>Electrical (resistivity, self potential, induced polaritation) and physical properties of earth’s materials, role of electrical and electromagnetic methods in geophysics, DC electrical method, electrode configuration, vertical electrical sounding (VES) and profiling techniques, layered earth model (1-D), Induced Polarization (IP), chargeability and metal factor, Self-Potential (SP), Maxwell’ss equations, EM field equations, passive methods: very low frequency (VLF), magnetotellruics (MT), Audio MT and controlled-source audio-frequency magnetotellurics (CSAMT) methods, Active Methods: Transient EM (TEM), Long Offshet TEM, Ground Penetrating Radar (GPR) and an overview application of EM Methods.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td><table>
<tr><td>Midterm test</td><td>√</td><td>35%</td></tr>
<tr><td>Final Test</td><td>√</td><td>35%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>15%</td></tr>
<tr><td>Laboratory work</td><td>√</td><td>15%</td></tr>
</table></td></tr>
<tr><td>Media employed</td><td>Slides, beamer, boards, appropriate software, online communication, internet, exercises, laboratory activities</td></tr>
<tr><td>Reading list</td><td>
1. Reynolds, J.M., An Introduction to Applied and Environmental Geophysics, 2nd Edition, ISBN: 978-0-471-48535-3,2011.
2. Telford, W.M., Gelgard, L.P., Sheriff, R.E., Applied Geophysics, Cambridge University Press, 1990.
3. Beblo, M. (ed.),, Umweltgeophysik, , Ernst & Sohn, 465 pp, 1998
4. SEGJ, Application of Geophysical Methods to Engineering and Environmental Problem, , Cambridge Univ. Press, 2004
5. Nabighian M.N., (ed.),, Electromagnetic Methods in Applied Geophysics, Vol.1. Theory, Vol.2 Application,, , Society of Exploration Geophysicists, 1989
</td></tr>
</table>

36. Gravity and Geomagnetics

Module designation	Gravity and Geomagnetics
Module level	Bachelor
Code, if applicable	TG3263
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Gravity and Magnetics
Semester(s) in which module is taught	Sixth Semester / Third Year
Module coordinator(s)	Dr. Susanti Alawiyah
Lecturer(s)	Dr. Susanti Alawiyah, ST,MT, Dr. Dadi Abdurrahman, ST,MT, Dr. Eko Januari Wahyudi, 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 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 material.	√

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session
Supervision and consultation
Practical or experimental laboratory work</td><td>1 hours</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>3</td></tr>
<tr><td>Total workload per semester</td><td>99 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>1. TG2101 Geomathematics I.
2. TG2203 Geomathematics II.
3. TG2204 Potential Theory.</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Gravity and geomagnetic anomaly.
• Subsurface density and susceptibility.
• Gravity and geomagnetic data acquisition.
• Gravity and geomagnetic data processing.
• Gravity and geomagnetic modeling.
• Gravity and geomagnetic interpretation.</td><td>• Be able to use mathematical tools and certain software for gravity and geomagnetic processing.</td><td>• Be able to calculate CBA, Regional, Residual, and filtering, Magnetic anomaly.
• Be able to working with gravity and geomagnetic data in field-camp from data acquisition, modeling, and interpretation.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>The meaning of gravity and magnetic in identification of subsurface density and susceptibility change for geodynamics, exploration, geotechnics and environmental and its application examples, density and susceptibility of rock, basic theory of gravity, gravity anomaly, gravity data reduction, gravimeter, field operation, density estimation from gravity data, main and outer magnetic field, magnetic anomaly, reduction of magnetic data, magnetometer, regional-residual anomaly separation, qualitative interpretation, quantitative interpretation using forward modeling and inversion</td></tr>
</table>

<table>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>25%</td></tr>
<tr><td>Presentation, quizzes, homework</td><td>√</td><td>45%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, boards, appropriate software, exercise, gravimeter</td></tr>
<tr><td>Reading list</td><td>
1. Blackly, Richard. J, Potentiaol Theory in Gravity and Magnetic Application, Cambridge Univ. Ptress, 1995
2. Grant & West, Interpretation Theory in Applied Geophysics. Mc. Graw-Hill, 1969.
3. Hinze, W.J., Von Frese, R.R.B, and Saad, A.H., Gravity and Magnetic Exploration, 2013.
4. Reynold, J.M., An Introduction to Applied and Environmental Geophysics, John Wiley and Sons Ltd., 1997.
5. W.M Telford, L.P Geldart, R.E Sheriff, and D.A Keys, Applied Geophysics, Cambridge University Press, 1988.
</td></tr>
</table>

37. Geodynamics

Module designation	Geodynamics
Module level	Bachelor
Code, if applicable	TG3222
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Geodynamics
Semester(s) in which module is taught	Sixth Semester / Third Year
Module coordinator(s)	Class 1: Prof.Dr. Andri Dian Nugraha S.Si.,M.Si. Class 2: Dr.rer.nat. David Prambudi Sahara, S.T, M.T.
Lecturer(s)	Class 1: Prof.Dr. Andri Dian Nugraha S.Si.,M.Si., Dr. Zulfakriza, S.Si.,MT Class 2: Dr.rer.nat. David Prambudi Sahara, S.T, M.T., Dr. Endra Gunawan, S.T., 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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td></td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>2 hours</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Students understand basic for further study related to Earth's plates dynamics
• Students understand: plate tectonics, mantle convection, plate boundary, Wilson cycle, hot spot, triple junction, Earth’s interior, kinematics, morphology and deformation; Mechanics: Force and rheology; and dynamics process.</td><td>• Able to describe the basic for further study related to Earth's plates dynamics.
• Able to describe describe principles of plate tectonics, mantle convection, Wilson cycle, hot spot, triple junction, kinematics, morphology and deformation; Mechanics: Force and rheology; and dynamics process.</td><td>• Possesses an extensive knowledge to describe the basic for further study related to Earth's plate’s dynamics.
• Familiar with tectonic processes, subduction zone worldwide, Benioff zone, and fault plane solution determination</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Basic understanding of the plate motion that includes its mechanism i.e. mantle convection as the driving force for surface tectonic processes, heat flow, and volcanism (hot spot). Processes of subduction, triple junction, graben, transform fault and continental/arc-arc collision as summarized within the Wilson cycle</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>40%</td></tr>
<tr><td>Final Test</td><td>√</td><td>40%</td></tr>
<tr><td>Presentation, quizzes, homework</td><td>√</td><td>20%</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, whiteboards, appropriate software, online communication, internet, exercises, etc.</td></tr>
</table>

Reading list	• Gubbins, D.: “Seismology and Plate Tectonics”, Cambridge University Press, Cambridge, 1990. • Richards, M.A., Gordon, R.G. and Van der Hilst, R.D.: “The History and Dynamics of Global Plate Motions”, American Geophysical Union, Washington, 2000. • Fowler, C.M.R., *et al.*: “The Solid Earth: An Introduction to Global Geophysics”, Cambridge University Press, Cambridge, 2005. • Turcotte, D.L. and Schubert, G.: “Geodynamics”, Cambridge University Press, Cambridge, 2014

38. Fieldwork

Module designation	Fieldwork
Module level	Bachelor
Code, if applicable	TG3290
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Fieldwork
Semester(s) in which module is taught	Sixth Semester / Third Year
Module coordinator(s)	Prof. Dr. Satria Bijaksana
Lecturer(s)	Prof. Dr. Satria Bijaksana, Prof. Dr. Ir. Djoko Santoso, M.Sc., Faridz Nizar Ahmady, S.T., M.T., Ekkal Dinanto, S.T., M.T., Dadi Abdurrahman, ST, MT, Dr. Eng. Ir. T.A. Sanny, MT, Fernando Lawrens Hutapea, 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 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 material.	√

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>1 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>1 hour</td></tr>
<tr><td>Practical or experimental laboratory work</td><td></td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>80 hours</td></tr>
<tr><td>Total workload per semester</td><td>164 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirement’s prerequisites</td><td>All basic course on geology and geophysics</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr>
<td>• Understand the importance of geological information and geological observation in geophysical works.
• Understand the principles and methodologies in general geophysical methods (gravity, magnetic, refraction seismology, geoelectricty, GPR (ground penetrating RADAR), EM methods)
• Understand the importance of combined methods in geophysical exploration
• Understand the basic elements in designing geophysical surveys.</td>
<td>• Having field experience in geological and geophysical survey.
• Able to conduct basic geological survey that include field observation, data processing and producing basic geological map
• Able to design simple geophysical survey by considering the availability of manpower, instruments, logistics, transports etc.
• Able to operate basic geophysical instruments in the field including simple trouble shooting
• Able to handle and process data generated by geological and geophysical surveys.
• Able to make simple interpretation on the results of geophysical surveys
• Able to communicate his/her own finding through oral presentation as well as through written report
• Able to work in a team in the stressful field environment.</td>
<td>• Confidence in leading a simple geophysical survey
• Confidence in becoming part of large geophysical survey in charge a specific task.
• Willingness to learn more about field geophysics.</td>
</tr>
</table>
</td></tr>
</table>

<table>
<tr><td>Content</td><td>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 methods will be applied on the field, namely: refraction seismic, gravity, magnetic, geoelectrical, and Ground Penetrating RADAR.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td><table>
<tr><td>Onsite performance</td><td>√</td><td>30%</td></tr>
<tr><td>Preliminary Report</td><td>√</td><td>20%</td></tr>
<tr><td>Presentation</td><td>-</td><td>-</td></tr>
<tr><td>Final Report</td><td>√</td><td>50%</td></tr>
</table></td></tr>
<tr><td>Media employed</td><td>Geophysical instruments (magnetometer, resistivity-meter, gravimeter, refraction seismometer, GPR), computer (PC and laptop), geological compass, GPS, topography map, whiteboard, projector, and safety equipment</td></tr>
<tr><td>Reading list</td><td>1. Santoso, D. et al. Panduan Teknis Survei Lapangan Geologi & Geofisika (Untuk Mahasiswa), ITB Press, 2021.
2. Telford, W.M., Geldart, L.P., Sheriff, R.E., Applied Geophysics, 2nd Edition, Cambridge Univ. Press, 1990.
3. Reynolds, J.M., An Introduction to Applied and Environmental Geophysics. John Wiley and Sons, 1997.</td></tr>
</table>

39. Advanced Geophysical Instrumentation

Module designation	Advanced Geophysical Instrumentation
Module level	Bachelor
Code, if applicable	TG3001
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Advanced Geophysical Instrumentation
Semester(s) in which module is taught	Seventh or Eight Semester / Fourth Year
Module coordinator(s)	Dr. Warsa S.Si.,MT
Lecturer(s)	Dr. Warsa S.Si.,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 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 material.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td></td></tr>
<tr><td>Supervision and consultation</td><td></td></tr>
<tr><td>Practical or experimental laboratory work</td><td>1 hour</td></tr>
<tr><td>Individual studies</td><td>6 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td></td></tr>
<tr><td>Class project</td><td></td></tr>
<tr><td>Field trip</td><td></td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td></td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding diverse principle of transducer device in geophysics.
• Understanding the concept of measuring system in geophysics.
• Understanding the concept of data acquisition system.</td><td>• Able to proficient in electronics instrumentation system measurement.
• Able to make simple acquisition survey design.
• Able to explain instrumentation and information measuring system integration.</td><td>• Possess the ability on geophysical information providing principle and characteristic of transducer device.
• Possess the ability on using electronic instrumentation which is related with measuring method and operating the geophysical instrumentations in the application of sub-surface reconstruction.
• Possess the ability on designing instrumentation configuration and to make integrated instrumentation and information measuring system.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Basic configuration of instrumentation system, instrumentation characteristics, components of instrumentation, properties of electronic instrumentation. Examples of electronic instrumentation platform for recently geophysical application and future development.</td></tr>
</table>

<table>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>30%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>20%</td></tr>
<tr><td>Laboratory work</td><td>√</td><td>20%</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td></td></tr>
<tr><td>Reading list</td><td>
1. Rangan, Sarma, Mani. Instrumentation: Device and System. Tata Mc. Graw-Hill, 1992.
2. Jacon Fraden. Handbook of modern sensor: Physics, Design and Applications. AIP press, Springer-Verlag, New York, 1996.
3. Charles K. Alexander, Matthew N. O. Sadiku. Fundamentals of Electric Circuits, Fourth Edition, The McGraw-Hill Companies, Inc, 2007.
</td></tr>
</table>

40. Communication in Geophysics

Module designation	Communication in Geophysics
Module level	Bachelor
Code, if applicable	TG4001
Sub-heading, if applicable:	
Courses included in the module, if applicable:	Communication in Geophysics
Semester(s) in which module is taught	Seventh Semester / Fourth Year
Module coordinator(s)	Prof. Dr. Satria Bijaksana, Silvia Jannatul Fajar, S.T., M.T., Prof. Dr. Ir. Djoko Santoso, M.Sc., Faridz Nizar Ahmady, S.T., M.T.
Lecturer(s)	Dr. Agus Laesanpura
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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>• TG3290 Field Camp Geophysics.
• KU-102X English.
• KU-1011 Scientific Paper Writing.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding the scientific culture for reasoning and its evolving.
• Understanding oral presentation and writing thoroughly.</td><td>• Able to write abstract and resume.
• Able to do presentation, poster, report and article formatting.</td><td>• Possess an extensive knowledge of scientific reasoning.
• Possess an extensive knowledge of communication in writing and oral presentation.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Building knowledge supported by publication have an importance in diversification of Technology finding and scientific discovery. On this occasion student experiencing about scientific culture, its activity, introducing to thinking by reasoning, logic, empirical and experiment; The activity of scientific community in form of paper, report, publication with standard formatting. The practical activity is toward synopsis, analytical reasoning and argumentation, presentation technique with scientific culture.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>45%</td></tr>
<tr><td>Homework</td><td>√</td><td>25%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>White board, notebook, LCD projector, power point and drawing software</td></tr>
<tr><td>Reading list</td><td>1. Briscoe, M.H., A guide to scientific illustrations.
2. Nicolle, Jean Marie, Histoire des methods Scientifiques, Breal, 1994.
3. O’Connor, Writing Succesfully in Science, Chapman & Hall, 1996.</td></tr>
</table>

41. Final Project I

Module designation	Final Project I
Module level	Bachelor
Code, if applicable	TG4092
Sub-heading, if applicable:	
Courses included in the module, if applicable:	Final Project I
Semester(s) in which module is taught	Seventh Semester / Fourth Year
Module coordinator(s)	Dr.Eko Januari Wahyudi
Lecturer(s)	Dr.Eko Januari Wahyudi
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 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.	√

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>-</td></tr>
<tr><td>Tutorial session</td><td>1 hour</td></tr>
<tr><td>Supervision and consultation</td><td>1 hour</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>-</td></tr>
<tr><td>Presentation</td><td>2 hours</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>Optional</td></tr>
<tr><td>Total workload per semester</td><td>98 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>1. All Courses related to the final project topic</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Deep understanding of the selected topics and the geophysical method applied.</td><td>• Able to conduct geophysical data acquisition and/or processing and/or interpretation to solve the selected problem.</td><td>• Possess the capability to do the geophysical study of a method case or a study area case, write its report and present it</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Basic concept discussion regarding topic which is chosen as the final project, progress report of the research, tutorial, Final project’s proposal completion.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Basic concept comprehension</td><td>√</td><td>50%</td></tr>
<tr><td>Proposal progress</td><td>√</td><td>10%</td></tr>
<tr><td>Proposal’s presentation and examination, knowledge improvement</td><td>√</td><td>40%</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, whiteboards, appropriate software, online communication, internet, exercises, etc., and also some geophysical instruments depend on the topic of the final project student work on</td></tr>
<tr><td>Reading list</td><td>Literature depends on the topic of the final project</td></tr>
</table>

42. Seismic Interpretation

Module designation	Seismic Interpretation
Module level	Bachelor
Code, if applicable	TG4162
Sub-heading, if applicable:	
Courses included in the module, if applicable:	Seismic Interpretation
Semester(s) in which module is taught	Seventh Semester / Fourth Year
Module coordinator(s)	Prof. Sigit Sukmono
Lecturer(s)	Prof. Sigit Sukmono, Prof. 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 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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>3 hours</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>TG3261 Seismic Reflection Data Acquisition & Processing.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding relations of rock-physics parameters with Vp, Vs and density, and then with seismic amplitude responses.
• Understanding how to apply knowledge in point 1 to do seismic interpretation for hydrocarbon exploration which include forward modeling, well-seismic tie, stratigraphy & structural interpretation, 3D seismic interpretation and analysis of lithology-porosity-fluids effects.
• Understanding how to do time-depth conversion.
• Understanding interpretation pitfalls.</td><td>• 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.</td><td>• Possess the capability to do seismic interpretation for hydrocarbon exploration and development.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Objective, role of rock-physics, Wyllie & Biot-Gassman equations and their applications, phase, polarity, resolution, effect of lithology-porosity-fluids, forward modelling of seismic amplitude, well-seismic tie, stratigraphy & structural interpretation, 3D seismic interpretation, time-depth mapping, pitfall analysis</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>40%</td></tr>
<tr><td>Quizzes, assignment</td><td>√</td><td>30%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, boards, appropriate software’s, online communication, internet, exercises</td></tr>
<tr><td>Reading list</td><td>1. Sukmono, S., 2010, Diktat Kuliah Interpretasi Seismik Refleksi, ITB.
2. Brown, A.R., 2009, Interpretation of 3-Dimensional Seismic Data.</td></tr>
</table>

43. Geophysical Inversion

Module designation	Geophysical Inversion
Module level	Bachelor
Code, if applicable	TG4141
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Geophysical Inversion
Semester(s) in which module is taught	Fifth Semester / Third Year
Module coordinator(s)	Prof. Dr. Hendra Grandis
Lecturer(s)	Prof. Dr. Hendra Grandis, Dr. Tedi Yudistira, S.Si.,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 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 Visit field area or company which is related to course material.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class Project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>TG2101 Geomathematics I.
TG2203 Geomathematics II.
TG2240 Computing in Geophysics.
TG2111 Introduction to Geophysics.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals:
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understand to identify forward and inverse problems in geophysics.
• Understand to identify linear and non-linear inverse problems.
• Understand to identify influence of data uncertainty to the solution of inverse problems.
• Understand to integrate diverse type of prior information and / or constraints into solution to linear inverse problems.</td><td>• Capable to make formulation of linear forward and inverse problems using matrix form.
• Capable to make formulation of solutions to linear inverse problems.
• Able to make formulation of solutions to non-linear inverse problems using local / linearized approach.
• Able to make formulation of solutions to non-linear inverse problems using global approach.</td><td>• Possess ability to solve linear and non-linear inverse problems in geophysics using various methods introduced and discussed in this course.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Concept of geophysical modeling, concept of forward modeling and inverse modeling,solving linear regressionusing least-squares principle, formulation of linear inverse problems, solution of linear inversion, weighted linear inversion, damped linear inversion, formulation of non-linear inverse problems, linearized approach of non-linear inversion, global approach of non-linear inversion, systematic/grid search, random search, Monte-Carlo method, guided random search method, simulated annealing method, genetic algorithm.</td></tr>
</table>

<table>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>35%</td></tr>
<tr><td>Final Test</td><td>√</td><td>35%</td></tr>
<tr><td>Assignments</td><td>√</td><td>30%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
Minimum presence percentage 70%. Usually Top 10% will have grade A with lower grades distributed among the rest.
</td></tr>
<tr><td>Media employed</td><td>Conventional lectures using e.g. whiteboard, computer, etc., computer exercises, video courses from internet, etc.</td></tr>
<tr><td>Reading list</td><td>

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

</td></tr>
</table>

44. Capita of Selecta in Geophysics

Module designation	Capita of Selecta in Geophysics
Module level	Bachelor
Code, if applicable	TG4029
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Capita of Selecta in Geophysics
Semester(s) in which module is taught	Seventh Semester / Fourth Year
Module coordinator(s)	Prof. Satria Bijaksana
Lecturer(s)	Prof. Satria Bijaksana, Dr. Endra Gunawan, ST,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 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.	-
Field Trip Visit field area or company which is related to course material.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>2 hours</td></tr>
<tr><td>Class Project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>TG2111 Introduction to Geophysics.
TG4028 Geophysical Exploration.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals:
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Familiar with contemporary fields related to geophysics (such as earthquakes, tsunami and other natural hazards, earthquake monitoring from space, Community preparedness, Earth’s magnetic field, rock magnetism, limnology, agriculture geophysics).
• Understand the challenges and opportunities is his/her future career in geophysics and related fields.</td><td>• Able to obtain information and literature about rock magnetism.
• Able to grasp the potential uses of magnetic characterization in fields such as exploration of resources to environmental problems.
• Able to describe the space-based tools to monitor disaster.
• Able to describe the tsunami ready program.</td><td>• Possess ability to do the actual rock magnetic techniques from sample preparation to magnetic measurement.
• Possess ability to incorporate rock magnetic techniques as supplement to broader geophysical studies.
• Possess an extensive knowledge tof space -based tools to monitor disaster.
• Possess ability to explain the tsunami ready program.
• Having sound understanding on contemporary issues related to geophysics based on exposure during lectures and on self or group study using the available resources including the internet.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Giving the new research or last methods in Sciences and Geophysical Engineering. The student able to make the actual topics for research and exploration in Geophysics, given by our guest lecturers.</td></tr>
</table>

<table>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>35%</td></tr>
<tr><td>Final Test</td><td>√</td><td>35%</td></tr>
<tr><td>Assignments and quizzes</td><td>√</td><td>20%</td></tr>
<tr><td>Presence</td><td>√</td><td>10%</td></tr>
</table>
Students are considered to be competent and pass if at least get 50% of maximum mark of the exams and assignments. Assignments include paper’s review, oral presentation, and term paper.
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, boards, appropriate software, online communication, internet, exercises, lab visit, etc.</td></tr>
<tr><td>Reading list</td><td>

1. Butler, R. F., 1998, Paleomagnetism: Magnetic domains to geologic terranes: Electronic Edition, University of Arizona.
2. Evans, M. E., Heller, F.,2003, Environmental Magnetism: Principles and Applications of Environmagnetic,s, Academic Press.
3. Awange, J. L., 2012, Environmental Monitoring using GNSS: Global Navigation Satellite Systems, Springer Science & Business Media.
4. Tauxe, L., 2014, Essentials of Paleomagnetism: Second Web Edition, Scripps Institution of Oceanography.

Students are also invited to see videos, such as the followings:

1. *Disasters in Indonesia (https://www.youtube.com/watch?v=B09y9AQYZ-U)*
2. *Tools to Detect Earthquakes (https://www.youtube.com/watch?v=315jEnw2CZQ).*
3. *Capita Selecta in Geophysics: Episode 1 Magnetic Field (https://www.youtube.com/watch?v=Hi_S20qZl_0)*
4. *Capita Selecta in Geophysics: Episode 4 Rock Magnetism (https://www.youtube.com/watch?v=ZL2ZyHc_TO4)*
5. *Capita Selecta in Geophysics: Episode 13 What is Limnology? (https://www.youtube.com/watch?v=DzL5NNkPFUo)*

Students are also invited to visit the following YouTube channels

Geophysics for Everyone
(https://www.youtube.com/channel/UCCjpSIhSWwccpE0JL2kRu_Q)

Endra Gunawan FTTM ITB
(https://www.youtube.com/channel/UCVDitZUF4CSt7aHhvr2fhHw)
</td></tr>
</table>

45. Design in Geophysical Engineering

Module designation	Design in Geophysical Engineering
Module level	Bachelor
Code, if applicable	TG4047
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Design in Geophysical Instrumentation
Semester(s) in which module is taught	Seventh or Eight Semester / Fourth Year
Module coordinator(s)	Dr. Ir. Agus Laesanpura, M.S.
Lecturer(s)	Dr. Ir. Agus Laesanpura, M.S.
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. 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>2 hours</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td></td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understand basic knowledge of design in geophysical methods
• Understand to match geophysical methods to application in Engineering Case</td><td>• Able to solve a problem for engineering case using geophysical method
• Able to optimize the multi parameter in geophysics for engineering case</td><td>• Possess the capability of engineering problems identification and solving using geophysical methods
• Planning and designing a simple geophysical survey</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Design in geophysics related to problem solving of engineering case (infrastructure). Optimization of multiparameter geophysics equipped with case studies.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>30%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>40%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td></td></tr>
<tr><td>Reading list</td><td>Sheriff, R.E., Geophysical Methods, , Prentice Hall,
Reynolds, J.M., An Introduction to Applied and Environmental Geophysics, , John Wiley and Sons Ltd.</td></tr>
</table>

46. Special Topic in Geophysics

Module designation	Special Topic in Geophysics
Module level	Bachelor
Code, if applicable	TG4063
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Special Topic in Geophysics
Semester(s) in which module is taught	Seventh Semester / Fourth Year
Module coordinator(s)	Dr.rer.nat. R. Mohammad Rachmat ST., MT
Lecturer(s)	Dr.rer.nat. R. Mohammad Rachmat ST., MT; Dr. Eng. Fernando Lawrens 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 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.	-
Field Trip Visit field area or company which is related to course material.	√

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class Project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirement’s prerequisites</td><td>The students should be in the 4th year.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals:
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understand more deeply the relationship between geophysical application and the current energy issues. Students will be motivated to aware about the importance of environmental protection during the development of energy in Indonesia.</td><td>• The students will be able to develop new businesses related to the environmental-friendly energy sector.</td><td>• The students will be able to talk in the communities about the current situation of energy issues in Indonesia by showing and connecting recent data.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Oil and Gas bussiness, Hydrocarbon Reservoir, geothermal, green energy, CCS/CCUS.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>-</td><td>-</td></tr>
<tr><td>Final Test</td><td>√</td><td>50%</td></tr>
<tr><td>Assignments and quizzes</td><td>√</td><td>50%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
Students are considered to be competent and pass if at least get 50% of maximum mark of the exams and assignments. Assignments include paper’s review, oral presentation, and term paper.
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, boards, appropriate software, online communication, internet, exercises, lab visit, etc.</td></tr>
<tr><td>Reading list</td><td>
1. IPCC, 2007, Climate Change 2007: The Physical Science Basis, Contribution of Working Group I to the fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, 996 pp.
2. BP, 2021, Statistical Review of World Energy, 70th edition
3. Dewan Energi Nasional, 2020, Bauran Energi Nasional 2020.
</td></tr>
</table>

47. Job Training

Module designation	Job Training
Module level	Bachelor
Code, if applicable	TG4067
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Job training
Semester(s) in which module is taught	Seventh Semester / Fourth Year
Module coordinator(s)	Dr. Zulfakriza, S.Si.,MT,
Lecturer(s)	Dr. Zulfakriza, S.Si.,MT, Silvia Jannatul Fajar 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 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 company, students explain how to solve the problem in groups. Mentor 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 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 Visit field area or company which is related to course material. — √

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>-</td></tr>
<tr><td>Tutorial session</td><td>5 hour</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>20 hours</td></tr>
<tr><td>Total workload per week (duration: 4 weeks)</td><td>25 hours</td></tr>
<tr><td>Presentation</td><td>2 hours</td></tr>
<tr><td>Class Project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>Optional</td></tr>
<tr><td>Total workload per semester</td><td>102 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals:
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Students understand the work environment in company and know the role of geophysics.</td><td>• Able to work as employee.
• Write the report and make a presentation</td><td>• Possess ability to work according to job desk of geophysicist.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Students work in a company or government’s office for about one month to follow the program given by the company or government’s office. The job should be related to geophysics. The focus of the study and location of the company are chosen by the student themselves. This activity is dominated with independent study and learning process which is taught by the off-campus institution (generally is held by student’s advisor from a company). Discussion and presentation in front of lecturer and/or student’s advisor is done in the course.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>-</td><td>-</td></tr>
<tr><td>Final Test (Report)</td><td>√</td><td>100%</td></tr>
<tr><td>Assignments and quizzes</td><td>-</td><td>-</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Following the company’s facilities.</td></tr>
<tr><td>Reading list</td><td>Following the research topic/the focus of study.</td></tr>
</table>

48. Geotomography

Module designation	Geotomography
Module level	Bachelor
Code, if applicable	TG4128
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Geotomography
Semester(s) in which module is taught	Seventh Semester / Fourth Year
Module coordinator(s)	Dr. Andri Dian Nugraha
Lecturer(s)	Dr. Andri Dian Nugraha, Dr. T.A. Sanny
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. 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 Visit field area or company which is related to course material.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>6 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class Project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals:
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr>
<td>• Understand the basic concepts of geotomography imaging technology
• Understand procedure of geotomography
• Understand data acquisition of geotomography
• Understand ray tracing from source to receiver
• Understand mathematical equation of delay time tomography
• Understand matrix equation of delay time tomography
• Understand delay time tomographic inversion
• Understand resolution test of tomographic inversion
• Understand application of geotomography</td>
<td>• Familiar in basic concepts of geotomography imaging technology
• Able to create procedure of geotomography
• Familiar in data acquisition of geotomography
• Able to create program code of ray tracing from source to receiver
• Able to determine mathematical equation of delay time tomography
• Able to matrix equation of delay time tomography
• Familiar in delay time tomographic inversion
• Familiar in resolution test of tomographic inversion
• Familiar in application of geotomography</td>
<td>• Possesses in basic concepts of seismic geotomography technology
• Able to create procedure of geotomography
• Familiar in data acquisition of geotomography
• Able to create program code of ray tracing from source to receiver
• Able to determine mathematical equation of delay time tomography
• Able to matrix equation of delay time tomography
• Familiar in delay time tomographic inversion
• Familiar in resolution test of tomographic inversion
• Familiar in application of geotomography</td>
</tr>
</table>
</td></tr>
<tr><td>Content</td><td>The topics subject are focused into the following subtopics : fundamental concept of geotomography and its application of subsurface image reconstruction on local (active fault, volcano, geothermal, cross hole etc), regional (such as geodynamics of island arc and subduction zone) , and global scale (3-D image of earth interior and plume tectonics), data acquisition, step reconstruction of image, parameterization model, raytracing methodology, determining matrix of seismic tomography,</td></tr>
</table>

<table>
<tr><td></td><td>tomographic inversion, damping application, resolution test and interpretation.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td rowspan="3">equal</td></tr>
<tr><td>Final Test</td><td>√</td></tr>
<tr><td>Assignments and quizzes</td><td>√</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, boards, appropriate software, online communication, internet, exercises, lab visit, etc.</td></tr>
<tr><td>Reading list</td><td>

Nugraha, A. D. (2017). Tomografi Seismik, Penerbit ITB Press, ISBN 978-602-5417-48-1.
Zhao, D. (2019). Multiscale Seismic Tomography, Springer Geophysics, ISBN 978-4-431-55359-5.
Iyer H.M. and Hirahara, K. (Ed.), 1993. Seismic Tomography: Theory and Practice. Chapman & Hall, London.
Nolet, G. (Ed.), 1987. Seismic Tomography with applications in global seismology and exploration geophysics. D. Reidel Publishing Company, Dordrecht.
Press, W.H. et al., 1992, Numerical Recipes, Cambridge University Press, Cambridge.
Sanny, T. A., 2000, Geotomografi (diktat Kuliah), Jurusan Teknik Geofisika ITB.
Widiyantoro, S. Diktat Kuliah GF435 (Tomografi Geofisika), Jurusan Geofisika dan Meteorologi, FIKTM, ITB, dan referensi di dalamnya.

</td></tr>
</table>

49. Engineering & Environmental Geophysics

Module designation	Engineering & Environmental Geophysics
Module level	Bachelor
Code, if applicable	TG4142
Sub-heading, if applicable:	
Courses included in the module, if applicable:	Engineering & Environmental Geophysics
Semester(s) in which module is taught	Seventh Semester / Fourth Year
Module coordinator(s)	Dr. Wahyudi Widyatmoko Parnadi
Lecturer(s)	Dr. Widodo, Dr. Wahyudi Widyatmoko Parnadi
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 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.	√

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>2 hours</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>6 hours</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>10 hours</td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>1. TG3241 Geoelectrical and Electromagnetism.
2. TG3260 Gravity andMagnetics.
3. TG2240 Seismic Refraction.
4. TG3261 Seismic Reflection Data Acquisition & Processing</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understand basic knowledge of geophysical methods
• Understand engineering and physical properties of rocks
• Understand problems in engineering and environment (EE)
• Understand to match geophysical methods to application in EE
• Understand to conduct plan and design a geophysical survey
• Understand to process and interpret EE integrated geophysical data</td><td>• Able to recognize problems in EE
• Know the basics of exploration methods in geotechnical engineering, geological engineering, and hydrology
• Able to recognize the appropriate geophysical methods suitable for distinct EE problems
• Able to plan and design simple survey design for engineering and environmental purposes
• Able to conduct basic processing & interpretation of EE geophysical data</td><td>• Possess the capability of engineering and environmental problems identification and solving using geophysical methods
• Planning and designing a simple geophysical survey
• Familiar in conducting geophysical survey
• Familiar in processing and interpreting basic geophysical data
• Familiar in drawing conclusion from results of geophysical surveys</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Introduction: the meaning and role of geophysics for solving engineering and environmental problems, case examples of the application of engineering and environmental geophysics; physical and engineering properties; methodology of geotechnical exploration: sounding, boring etc.; engineering seismology: seismic reflection and refraction; earthquake risk analysis; seismic and non-seismic (gravity, magnetic, DC-resistivity, electromagnetics) exploration for hydrogeology, geotechnics and environment; geohazards: landslide and other phenomenon; stress and strain in soils/rocks; seepage and flow net; well-logging; case studies.</td></tr>
</table>

<table>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>45%</td></tr>
<tr><td>Final Test</td><td>√</td><td>35%</td></tr>
<tr><td>Quizzes, homework</td><td>√</td><td>20%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, whiteboards, appropriate software, online communication, internet, exercises, etc.</td></tr>
<tr><td>Reading list</td><td>

1. Reynolds, J.M., An Introduction to Applied and Environmental Geophysics, 2nd Edition, ISBN: 978-0-471-48535-3,2011.
2. Beblo, M. (ed.), Umweltgeophysik, Ernst & Sohn, 465 pp., 1997.
3. Derringh, E., Computational Engineering Geology, Prentice-Hall, Inc., 322 pp., 1998.
4. Keys, W. S., A Practical Guide to Borehole Geophysics in Environmental Investigations, SRC Press, Inc., 176 pp., 1997.
5. Sharma, P. V., 1997, Environmental and Engineering Geophysics: Cambridge University Press.
6. Ward, S. H. (ed.), Geotechnical & Environmental Geophysics, Soc. Expl. Geophys., 1032 pp., 1990.
7. Parnadi, W.W., 2008, Diktat Kuliah Geofisika Teknik dan Lingkungan.

</td></tr>
</table>

50. Rock Physics

<table>
<tr><td>Module designation</td><td>Rock Physics</td></tr>
<tr><td>Module level</td><td>Bachelor</td></tr>
<tr><td>Code, if applicable</td><td>TG4166</td></tr>
<tr><td>Sub-heading, if applicable:</td><td>-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td>Rock Physics</td></tr>
<tr><td>Semester(s) in which module is taught</td><td>Seventh Semester / Fourth Year</td></tr>
<tr><td>Module coordinator(s)</td><td>Dr. Fatkhan</td></tr>
<tr><td>Lecturer(s)</td><td>Dr. Fatkhan</td></tr>
<tr><td>Language</td><td>Bahasa Indonesia</td></tr>
<tr><td>Relation to curriculum</td><td>Elective Subject / Elective Course</td></tr>
<tr><td>Type of teaching, contact hours</td><td>
<table>
<tr><td>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.</td><td>√</td></tr>
<tr><td>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.</td><td>√</td></tr>
<tr><td>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.</td><td>√</td></tr>
<tr><td>Class project and discussion
Lecturer gives students a project which related to current issues and course material.</td><td>√</td></tr>
<tr><td>Supervision and consultation
This activity is continuation of class project. Students consults problem which they face and discuss together how to solve the problem.</td><td>-</td></tr>
<tr><td>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.</td><td>-</td></tr>
<tr><td>Field Trip
Visit field area or company which is related to course material.</td><td>-</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>1 hours</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class Project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirement prerequisites</td><td>TG2101 Geomathemathics I.
TG3261 Seismic Reflection Data Acquisition & Processing.
TG2205 Wave Theory in Geophysics</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals:
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understand how to analyze for determining lithology, porosity, pore fluids, and saturation.
• Understand how to bridges seismic data and reservoir properties and parameters.
• Understand the effects of various rock and reservoir parameters on seismic properties.
• Understand about applicability and assumptions of rock physic.</td><td>• Able to solve problems related to rock physics (modelling, fluid substitutions, effective medium theories).
• Capable to solve problems related to rock digital.
• Able to solve problems related to seismic anisotropy.</td><td>• Possess ability to solve problems related to rock physics challenges.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Student are expected to understand how elastic properties of rock change when fluid fills the rock, concept of effective medium theory, physical modelling to help understand in wave propagation and anisotropy of rock.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>40%</td></tr>
<tr><td>Assignments and quizzes</td><td>√</td><td>30%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
Students are considered to be competent and pass if at least get 50% of maximum mark of the exams and tasks.
</td></tr>
<tr><td>Media employed</td><td>Whiteboard, and software computer.</td></tr>
</table>

Reading list	1. Avseth, P., Mukerji, T., and Mavko., G., 2005, Quantitative Seismic Interpretation: Applying Rock Physics Tools to Reduce Interpretation Risk, Cambridge Univ. Press. 2. Mavko, G., Mukerji, T., and Dvorkin, J., 1998, the rock physics handbook: tools for seismic analysis in porous media: Cambridge Univ. Press. 3. Mavko, G., 2000, Rock Physics for Geophysical Reservoir Characterization and Recovery Monitoring, Rock Physics laboratory, Stanford University. 4. Schon, J., 2004, Physical Properties of Rock: Fundamentals and principles of Petrophysics, Elsevier. 5. Thomsen, L, 2002, Understanding Seismic Anisotropy in Exploration and exploitation, SEG. 6. Wang, Z, 2001, Fundamentals of rock physics: Geophysics, vol 66, 398-412.

51. Final Project II

Module designation	Final Project II
Module level	Bachelor
Code, if applicable	TG4092
Sub-heading, if applicable:	
Courses included in the module, if applicable:	Final Project II
Semester(s) in which module is taught	Seventh Semester / Fourth Year
Module coordinator(s)	Dr. Warsa
Lecturer(s)	Dr. Warsa
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 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.	√

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>-</td></tr>
<tr><td>Tutorial session</td><td>1 hour</td></tr>
<tr><td>Supervision and consultation</td><td>1 hour</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>7 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>2 hours</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>Optional</td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirement prerequisites</td><td>All Courses related to the final project topic</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Deep understanding of the selected topics and the geophysical method applied.</td><td>• Able to conduct geophysical data acquisition and/or processing and/or interpretation to solve the selected problem.</td><td>• Possess the capability to do the geophysical study of a method case or a study area case, write its report and present it</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Basic concept discussion regarding topic which is chosen as the final project, progress report of the research, tutorial, Final project’s proposal completion.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Basic concept comprehension</td><td>√</td><td>50%</td></tr>
<tr><td>Final Project result</td><td>√</td><td>10%</td></tr>
<tr><td>Proposal’s presentation and examination, knowledge improvement</td><td>√</td><td>40%</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, whiteboards, appropriate software, online communication, internet, exercises, etc., and also some geophysical instruments depend on the topic of the final project student work on</td></tr>
<tr><td>Reading list</td><td>Literature depends on the topic of the final project</td></tr>
</table>

52. Economical Geophysics and Management

Module designation	Economical Geophysics and Management
Module level	Bachelor
Code, if applicable	TG4269
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Economical Geophysics and Management
Semester(s) in which module is taught	Eighth Semester / Fourth Year
Module coordinator(s)	Dr. T. A. Sanny
Lecturer(s)	Dr. T. A. Sanny, Prof.Dr.Ir. Sigit Sukmono, M.Sc. Prof.Dr.rer.nat. Awali Priyono
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. 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding 'state of the art' business in technology and geophysical</td><td>• Able to proficient in basic entrepreneurial resources, entrepreneurial leadership, and entrepreneurial strategy.</td><td>• Possess make own business related with geophysics</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>The topics on the subject are focused into the following subtopics: fundamental concept of economy, economic model, economic model on desaster,economic model of earth desaster prevention, mortability model,mortability table, liability, the cost of capital of geophysical exploration; Basic concept, specific source of capital, managerial finance on exploration and exploitation, service marketing on geophysic, economics forecast on exploration and exploitation. The marginal cost and investment decision, gambling and risk management on exploration and exploitation,identification of risk measurement,creating competitive advantages, strategic management and formulation, and creating new opportunities on geophysical economy and business.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>40%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>30%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, boards, appropriate software, online communication, internet, exercise, etc.</td></tr>
<tr><td>Reading list</td><td>
1. Freeman, C., 1999, The Economics of Innovation, An Elgar Reference Collection.
2. Dess, G.G., Lumpkin, G.T., Eisner, A.B, 2007,Strategic Management, McGraw-Hill.
3. Gitman, L.J., 2006, Principle of Managerial Finance, Pearson Int. Edit.
4. Khalil, T., 2000, Management of Technology, McGraw-Hill
5. Lovelock, C&Wright, L.,Principles of Service Marketing&ManagementPrentice-Hill.
6. Pindyck, R.S& Rubinfeld, D.L., 1998, Econometric Models&Economic Forecasts, Irwin-McGraw-Hill.
7. Sanny, T. A., Tsunami Aceh, Penerbit Provinsi Nanggroe Aceh Darussalam.
</td></tr>
</table>

53. Volcanology and Geothermal Exploration

Module designation	Volcanology and Geothermal Exploration
Module level	Bachelor
Code, if applicable	TG4243
Sub-heading, if applicable:	
Courses included in the module, if applicable:	Volcanology and Geothermal Exploration
Semester(s) in which module is taught	Eighth Semester / Fourth Year
Module coordinator(s)	Prof. Djoko Santoso
Lecturer(s)	Dr.Ir. Fatkhan, MT, Dr.rer.nat. R. Mohammad Rachmat ST,MT, Prof. Dr. Ir., Djoko Santoso, M.Sc., Faridz Nizar Ahmady, 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 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 material.	√

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>6 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>4 hours</td></tr>
<tr><td>Total workload per semester</td><td>148 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>1. GL2111 Physical Geology.
2. GL2213 Tectonophysics.
3. TG3260 Gravity and Magnetics.
4. TG3241 Geoelectrical and Electromagnetism.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding volcanism.
• Understanding volcanic geology in Indonesia region.
• Understanding the nature of geothermal energy.
• Understanding geothermal exploration activities using geological, geochemical and geophysical methods.</td><td>• Able to explain the origin of igneous and volcanic rocks.
• Able to explain volcanic geology in Indonesia, their geological conditions, structure, stratigraphy and status of their activity.
• Able to propose suitable geophysical method for geothermal exploration especially in volcanic area.
• Able to follow the geothermal exploration activities using geological, geochemical and geophysical methods.
• Able to collect necessary data for reserve allocation and calculation.</td><td>• Possess the competence to explain of magmatic activity and their products.
• Possess the competence to explain volcanic geology and their activity in Indonesia region.
• Possess the capability of interpreting geophysical data in geothermal prospect.
• Possess the competence to make an comprehensive geothermal prospect interpretation.
• Possess the capability to calculate geothermal reserve.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Student are expected to understand volcanoes in Indonesia, Structure of volcanoes, its physical and chemical properties geothermal as one of major energy sources, geothermal fields in Indonesia exploration methods in geothermal</td></tr>
</table>

<table>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>40%</td></tr>
<tr><td>Quizzes, assignment</td><td>√</td><td>30%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides and LCD projectors, whiteboards, computer</td></tr>
<tr><td>Reading list</td><td>

1. Armstead, H.C.H. Geothermal Energy. J. Willey, 1978.
2. Ellis, A.J. & Mahon, W.A.J. Geochemistry and Geothermal System. Academic Press, 1977.
3. Keller, G.V. Exploration for Geothermal Energy. Dev. In Geophysics, Exp. Method 2, ed. A.A. Fitch, Ap. Sci.Pub, 1981.
4. Rybach, L & Muffler, L.J.P. Geothermal System Principles and Case Histories. J. Willey, 1981.
5. Santoso, D. Eksplorasi Energi Geothermal. Diktat Kuliah, Penerbit ITB, 2000.
6. Schmincke, H. U., Volcanism, Springer Verlag, 2004.
7. Bullard, F.M., Volcanoes of the Earth. Univ. of Queensland Press, 1977.
8. Civetta, L., Gasparini, P., Luongo, G. &Rapalla, A., Physical Volcanology. Elsevier, 1974.
9. de Broer, J.Z. and Sanders, D.T., Volcanoes in Human History: The far-reaching effects of major eruptions, Princeton Univ. Press, 2002.
10. Santoso, D., Diktat Kuliah Volkanofisik. Penerbit ITB, 2000.

</td></tr>
</table>

54. Numerical Simulation of The Earthquake

Module designation	Numerical Simulation of the Earthquake
Module level	Bachelor
Code, if applicable	TG4223
Sub-heading, if applicable:	
Courses included in the module, if applicable:	Numerical Simulation of the Earthquake
Semester(s) in which module is taught	Eighth Semester / Fourth Year
Module coordinator(s)	Dr. Wahyu Triyoso, M. Sc.
Lecturer(s)	Dr. Wahyu Triyoso, 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 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 and discussion 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 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 Visit field area or company which is related to course material.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>3 hours</td></tr>
<tr><td>Supervision and consultation</td><td></td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirement’s prerequisites</td><td>1. TG2205 Wave Theory in Geophysics.
2. TG3132 Earth Crust Mechanics.
3. TG3120 Seismology.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding the seismic wave propagation theory
• Understanding basic theory of Green Function and convolution
• Understanding basic extracting of source function of the earthquake and active fault mechanism</td><td>• Able to make an elastic wave propagation model
• Able to model seismic source of the earthquake-active fault
• Able to model body and surface wave</td><td>• Possess the ability to do a simple model of body wave model
• Possess the ability to do a simple model of surface wave model</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Numerical Simulation of The Earthquake is addressed to understand the mechanics of the earthquake, faulting, and understanding of Seismic Wave transmission and attenuation also its effect in seismic ground shaking.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>40%</td></tr>
<tr><td>Final Test</td><td>√</td><td>40%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>20%</td></tr>
<tr><td>Laboratory Work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, boards, appropriate software, online communication, internet, exercises, etc.</td></tr>
<tr><td>Reading list</td><td>1. Udias, A., Principle of Seismology, Cambridge University Press, Cambridge, 1999.
2. Stein and M. Wysession, 2002, An introduction to Seismology, Earthquakes and Earth Structure, Blackwell Publishing.
3. Scholz, C. H. 1990, The Mechanics and The Earthquake Faulting, Cambridge and University Press, Cambridge.
4. Mattew, J. H. and Fink, K. D, 1992, Numerical Methods Using Matlab, 3rd Ed, Prentice Hall.</td></tr>
</table>

55. Applied Seismology

Module designation	Applied Seismology
Module level	Bachelor
Code, if applicable	TG4225
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Applied Seismology
Semester(s) in which module is taught	Eighth Semester / Fourth Year
Module coordinator(s)	Dr. Wahyu Triyoso, M.Sc.
Lecturer(s)	Dr. Wahyu Triyoso, 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 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 material.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirement’s prerequisites</td><td>TG3120 Seismology</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding strong ground motion due to earthquake.
• Understanding Ground Motion Prediction Equation (GMPE).
• Understanding Seismicity Rate Modeling.
• Understanding seismic hazard analysis and Seismic Hazard Function.
• Understanding local site effects.</td><td>• Able to proficient in basic analysis on strong ground motion and GMPE.
• Able to proficient in determining seismicity rate model.
• Able to proficient in basic analysis on deterministic and probabilistic.
• Able to proficient in basic analysis on amplification.</td><td>• Possess to construct the Seismic Hazard Function (SHF)
• Possess the ability to make a simple probabilistic and deterministic hazard map.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Review of seismology: seismic waves, earthquake sources, earthquake size: Seismic hazard: types of seismic hazard; Strong ground motion: ground motion parameters, estimation of ground motion parameters; Seismic hazard analysis: identification and evaluation of earthquake sources, deterministic seismic hazard analysis, probabilistic seismic hazard; Local site effects: evidences from theoretical analysis and measurements, topography and basin effects; Ground motion design: design parameters and their development, development of ground motion time histories.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>40%</td></tr>
<tr><td>Final Test</td><td>√</td><td>40%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>20%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, boards, internet, exercises, etc.</td></tr>
<tr><td>Reading list</td><td>1. S.L. Kramer, Geotecnical Earthquake Engineering, Prentice Hall, New Jersey, 1996.
2. Bulletin of the Seismological Society of America.
3. Bulletin Internasional Seismology and Earquake Engineering</td></tr>
</table>

56. Physics of the Earth's Interior

Module designation	Physics of the Earth's Interior
Module level	Bachelor
Code, if applicable	TG4226
Sub-heading, if applicable:	
Courses included in the module, if applicable:	Physics of the Earth's Interior
Semester(s) in which module is taught	Eighth Semester / Fourth Year
Module coordinator(s)	Prof. Sri Widiyantoro
Lecturer(s)	Prof. Sri Widiyantoro and Dr. Andri Dian Nugraha
Language	Indonesian
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. 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 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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td></td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>1 hour</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>-</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understand seismic structure of the Earth’s Interior.
• Understand thermal structure of the Earth’s Interior.
• Understand minerals of the Earth’s Interior.
• Understand mantle convection processes.</td><td>• Able to conduct seismic modeling.
• Able to construct a simple geotherm.
• Able to describe minerals of the Earth’s Interior.
• Able to explain various mantle convection processes.</td><td>• Have the ability to apply seismic methods to image the Earth’s interior structure.
• Possess the ability to construct a steady state geotherm.
• Familiar with minerals of the Earth’s Interior and its tectonic implications (slab pull etc.).
• Familiar with various mantle convection processes.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Understanding the physical properties of the Earth’s interior, i.e. crust, lithosphere, mantle, and core. Discussion includes the seismological model of the Earth (e.g. P- and S-wave velocity structures, elastic moduli, quality factor, and density); geotherm (Earth’s heat) model with its mathematical derivation; the mineralogical model and its tectonic implication; and mantle convection models.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>40%</td></tr>
<tr><td>Presentation, quizzes, homework,</td><td>√</td><td>30%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Whiteboard, laptop, slides, animation, internet, and computer programming</td></tr>
</table>

Reading list	1. *Block 2 Earth Structure and Block 4 Earth Dynamics, The Open University Press, Milton Keynes, 1981.* 2. *Fowler, C.M.R., The Solid Earth: An Introduction to Global Geophysics, Cambridge University Press, Cambridge, 2nd edition, 2005.* 3. *Widiyantoro, S., 2004. Physics of the Earth's Interior, Departemen Geofisika dan Meteorologi, FIKTM, ITB, Bandung (in Indonesian).* 4. *Wyllie, P.J., The Dynamic Earth, John Wiley & Sons Inc., New York, 1971.*

57. Earthquake and Fault Mechanism

Module designation	Earthquake and Fault Mechanism
Module level	Bachelor
Code, if applicable	TG4264
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	Earthquake and Fault Mechanism
Semester(s) in which module is taught	Eighth Semester / Fourth Year
Module coordinator(s)	Dr. Wahyu Triyoso, M.Sc.
Lecturer(s)	Dr. Wahyu Triyoso, 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 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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>1. TG3120 Seismology.
2. TG3132 Earth Crust Mechanics.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding the mechanic earthquake and faulting.
• Understanding basic concept of elastic deformation, stress, strain.
• Understanding basic concept of seismic moment.
• Understanding basic concept of dislocation modeling.</td><td>• Able to make simple parameter active fault.
• Able to make simple model of deformation, strain, and stress.
• Able to model pre-and co-seismic slip.</td><td>• Possess the ability make a deformation model of active fault movement during pre-and co-seismic.
• Possess the ability to do a simple dislocation model to estimate stress, strain, and seismic moment.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Earthquake and Fault Mechanics is addressed to understand the mechanics of the earthquake and faulting and its effect in static stress change.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>40%</td></tr>
<tr><td>Final Test</td><td>√</td><td>40%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>20%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, whiteboards, appropriate software, online communication, internet, exercises, etc.</td></tr>
<tr><td>Reading list</td><td>1. Stein and M. Wysession, 2002, an introduction to Seismology, Earthquakes and Earth Structure, Blackwell Publishing.
2. Scholz, C. H. 1990, the Mechanics and the Earthquake Faulting, Cambridge and University Press, Cambridge.
3. Christopher H. Scholz, The Mechanics of Earthquakes and Faulting, Cambridge University Press, May 2, 2002 - Science - 471 pages
4. Mattew, J. H. and Fink, K. D, 1992, Numerical Methods Using Matlab, 3rd Ed, Prentice Hall.</td></tr>
</table>

58. Seismic Inversion for Reservoir

Module designation	Reservoir Seismic Inversion
Module level	Bachelor
Code, if applicable	TG4264
Sub-heading, if applicable:	
Courses included in the module, if applicable:	Reservoir Seismic Inversion
Semester(s) in which module is taught	Eighth Semester / Fourth Year
Module coordinator(s)	Ignatius Sonny Winardhie, Ph.D.
Lecturer(s)	Ignatius Sonny Winardhie, Ph.D., Ekkal Dinanto, S.T., M.T., Prof.Dr.Ir. Sigit Sukmono, M.Sc., Dona Sita Ambarsari, 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 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 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>3 hours</td></tr>
<tr><td>Tutorial session</td><td>3 hours</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>3 hours</td></tr>
<tr><td>Total workload per week</td><td>9 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>144 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>3</td></tr>
<tr><td>Requirements prerequisites</td><td>TG4162 Interpretation of Seismic Reflection.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding relationship between rock-physics parameters (such as porosity and water-saturation) and V_p, V_s, Density.
• Understanding basic concept of band-limited seismic signal, wavelet, reflection coefficient, convolution theorem, seismic amplitude responses, and seismic resolution in relation to previous point.
• Understanding basic concept of inversion methodology applied to seismic data.
• Understanding how to analyze post-stack and pre-stack seismic data as a response of impedance contrast.
• Understanding a number of seismic inversion methodologies along with their limitations and advantages.
• Understanding how to interpret seismic inversion results and pitfalls.</td><td>• Able to given the log data, able to find the reservoirs and the most sensitive impedance parameters that describe those reservoirs.
• Able to given the log and seismic data, able to do well-to-seismic tie and to do the seismic interpretation appropriately.
• Able to given point 1 and point 2 ready, able to choose, perform and deliver the most appropriate seismic inversion.
• Able to given point 3 ready, able to interpret them in terms of reservoir properties.</td><td>• Possess find the most sensitive impedance parameters for characterizing the reservoir.
• Possess choose the best seismic inversion methodologies which will handle the reservoir characterization tasks appropriately.
• Possess deliver and interpret the seismic inversion results in terms of reservoir properties.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Mathematical foundation and geological application of complex attributes, amplitude attributes, time attributes. Time lapse seismic.</td></tr>
</table>

<table>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>40%</td></tr>
<tr><td>Attendance, quizzes, homework</td><td>√</td><td>30%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, beamer, whiteboards, appropriate software, online communication, internet, exercises, etc.</td></tr>
<tr><td>Reading list</td><td>1. Sukmono, S., Post and Prestack Seismik Inversion for Hydrocarbon Reservoir Characterization, Diktat Kuliah ITB, 2007.
2. Russel, B.M., 1995, Introduction to Seismic Inversion Method, SEG.</td></tr>
</table>

59. Seismic Attributes for Reservoir

Module designation	Seismic Attributes for Reservoir Characterization
Module level	Bachelor
Code, if applicable	TG4265
Sub-heading, if applicable:	
Courses included in the module, if applicable:	Seismic Attributes for Reservoir Characterization
Semester(s) in which module is taught	Eighth Semester / Fourth Year
Module coordinator(s)	Dr. Fatkhan
Lecturer(s)	Dr. Fatkhan
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. 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 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 Visit field area or company which is related to course material.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>3 hours</td></tr>
<tr><td>Class project</td><td>10 hours</td></tr>
<tr><td>Field Trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>84 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirement prerequisites</td><td>TG4162 Interpretation of Seismic Reflection.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding analyze and enhance or quantify features of interpretation.
• Understanding infer some geologic features or reservoir property of interest.
• Understanding quantify amplitude and morphological features using deterministic calculations etc.
• Understanding discusses its applicability and assumptions.</td><td>• Able to solve problems related to seismic attributes that are derived from seismic data.
• Able to solve problems related to seismic interpretation by using powerful aid from seismic attributes.</td><td>• Possess solve problems related to seismic attribute challenges</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>Mathematical foundation and geological application of complex attributes, amplitude attributes, and time attributes</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>30%</td></tr>
<tr><td>Final Test</td><td>√</td><td>40%</td></tr>
<tr><td>Attendance, quizzes, homework, presentations</td><td>√</td><td>30%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Whiteboard, and software computer</td></tr>
<tr><td>Reading list</td><td>1. Alistair R Brown, Interpretation of three-dimensional seismic data, AAPG Memoir 42.
2. Chopra, S., and Kurt J Marfurt, Seismic attributes for prospect identification and reservoir characterization, Geophysical Development No.11.
3. Sukmono, S., 2007, Seismic Attribute for Hydrocarbon Reservoir Characterization, Diktat Kuliah ITB, 2007.</td></tr>
</table>

60. Introduction to Seismic Stratigraphy

Module designation	Principle Stratigraphy
Module level	Bachelor
Code, if applicable	GL 4168
Sub-heading, if applicable:	
Courses included in the module, if applicable:	Principle Stratigraphy
Semester(s) in which module is taught	Fourth Semester / Second Year
Module coordinator(s)	Dr. Khoiril Anwar Maryunani
Lecturer(s)	Dr. Khoiril Anwar Maryunani
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. 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.	-

<table>
<tr><td>Workload</td><td>
<table>
<tr><td>Class lectures</td><td>2 hours</td></tr>
<tr><td>Tutorial session</td><td>-</td></tr>
<tr><td>Supervision and consultation</td><td>-</td></tr>
<tr><td>Practical or experimental laboratory work</td><td>-</td></tr>
<tr><td>Individual studies</td><td>4 hours</td></tr>
<tr><td>Total workload per week</td><td>6 hours</td></tr>
<tr><td>Presentation</td><td>-</td></tr>
<tr><td>Class project</td><td>-</td></tr>
<tr><td>Field trip</td><td>-</td></tr>
<tr><td>Total workload per semester</td><td>96 hours</td></tr>
</table>
</td></tr>
<tr><td>Credit points</td><td>2</td></tr>
<tr><td>Requirements prerequisites</td><td>GL2151 Sedimentology</td></tr>
<tr><td colspan="2">Learning Goals
<table>
<tr><th>Knowledge</th><th>Skill</th><th>Competence</th></tr>
<tr><td>• Understanding the concept of strata of rock, how it occupy in space,
• Understanding the concept of stratigraphy nomenclature, and its meaning among the geology discipline
• Understanding several techniques related to Biostratigraphy, lithostratigraphy and Chronostratigraphy.</td><td>• Able to make correlation of stratigraphy unit.
•</td><td>• Possess an extensive knowledge of interpretation of fault and facies changes from a borehole or vertical measurement.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>The sedimentary rock occupy in space. Basic stratigrafi and reconstruction. lithostratigrafi, biostratigraphy, and Chronostratigraphy; stratigraphy nomenclature (Indonesian). Correlation and Historical geology. The economic aspect of stratigraphy correlation.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
<table>
<tr><td>Midterm test</td><td>√</td><td>45%</td></tr>
<tr><td>Final Test</td><td>√</td><td>35%</td></tr>
<tr><td>Presentation, quizzes, homework</td><td>√</td><td>20%</td></tr>
<tr><td>Laboratory work</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Slides, Beamer, boards, internet, exercises</td></tr>
<tr><td>Reading list</td><td>1. Dunbar,C.O and Rodgers,J (157), Principal of Stratigraphy
2. Schoch, R.M, (1989), Stratigraphy: Principal and Methods
3. Martodjojo, S dan Djuhaeni, (1996), Sandi Stratigrafi Indonesia</td></tr>
</table>