Appendix A: Module Handbook

ASIIN

UNDERGRADUATE PROGRAM OF GEOLOGICAL ENGINEERING
FACULTY OF EARTH SCIENCE AND TECHNOLOGY
INSTITUT TEKNOLOGI BANDUNG

2017

Geology Compulsory Courses 3rd Year

Module name:	**Marine Geology**				
Module level, if applicable	3rd year				
Code, if applicable	GL 3001				
Semester(s) in which the module is taught	Every semester				
Person responsible for the module	Dr. Ir. Andri Slamet Subandrio, Dipl. Geol.				
Lecturer	Dr. Ir. Andri Slamet Subandrio, Dipl. Geol.				
Language	Indonesian				
Relation to curriculum	Compulsory Course				
Types of teaching and learning	Class Size	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Lecture	80	2	Lecture, discussion, and group projects	Lectures	28
				Preparation and Follow up	56
Total Workload	84 hours				
Credit points	2 CU				
Requirements according to the examination regulations	Minimum attendance at lectures is 80% (according to ITB regulation). Final score is evaluated based exams				
Recommended prerequisites	1. Physical Geology (prerequisite) 2. Sedimentology (corequisite)				
Module objectives/intended learning outcomes	Students know and understand the character and the physical properties of the ocean and sea water, as well as the role of the sea in geological processes, and are able to use it to help reconstruct the geological phenomena, climatology, and oceanographic history.				
Content	The lecture explains the influence of oceans to the deposition system in littoral, shelf, slope to deep-sea environments, with the role of continent and ocean components, as well as of biological interaction. It is also describes the controls on seawater circulation, waves, and it correlations with paleoclimate and paleo-oceanography. The lecture then explains the economic aspects of seabeds (minerals, hydrocarbon, etc.) and environmental aspects in exploit them. Lecture is given to explain the characters and physical-chemical properties of seawater, and its role in underwater geological processes such as development of oceanic basins, oceanic sedimentation in different depths, and its correlation with paleoclimate and paleo-oceanography. Some aspects that will be discussed in this course: 1. Introduction into marine geology 2. Plate tectonic and oceanic basin characteristic 3. Geology and geophysics method on marine geology 4. Physical process in the ocean				

	5. Sea level changes 6. Coastal system 7. Continental margin 8. Marine sedimentation 9. Coral reef 10. Ocean chemistry and deep ocean sediment 11. Ocean circulation 12. Paleoclimate and Paleo-oceanography 13. Marine resources and environmental awareness
Study and examination requirements and forms of examination	Paper Test
Media employed	Presentation slides
Reading list	1. Anderson RN, (1986), Marine Geology, A planet earth perspective, John Wiley, USA 2. Bhatt, JJ., (1978), Oceanography, Exploring the planet ocean, Van Nostrand, NY, USA 3. Cronan DS, (1992), Marine Minerals in Exclusive Economic Zones, Chapman & Hall, London, UK 4. Doyle LJ & Pilkey OH., (1979), Geology of Continental Slope, Soc. Of Econ. Paleon. And Min., Spec Pub. No. 27., Tusla Okla. USA 5. Rona PA, Bostrom K, Laubier L, and Smith KL, (1983), Hydrothermal Processes at Seafloor Spreading Centers, NATO Sci. Affair Div., Plenum, NY 6. Ross DA., 1977, Introduction to Oceanography, 2nd edition, Prentice Hall Inc., Eaglewood Cliffs, New jersey 07632, 429p. 7. Weisberg J & Parish H., 1974, ..., McGraw Hill Book Company, New York, 315p

Module name:		**Geocomputation**			
Module level, if applicable		3rd year			
Code, if applicable		GL3101			
Semester(s) in which the module is taught		5th Semester			
Person responsible for the module		Prof. Ir .Lambok M. Hutasoit, M.Sc, Ph.D.			
Lecturer		Dr. Ir. Asep Heri Patria Kesumanjana, M.T. and Agus M. Ramdhan, S.T., M.T., Ph.D.			
Language		Indonesian			
Relation to curriculum		Compulsory Course			
Types of teaching and learning	Class Size	Attendance time (hours per week per semester)	Forms of active participation	Workload	
lecture, practical, and homework	90	3	Lecture and discussion	Lectures: 3 hours x 14 times	42
				Preparation and Follow up: 4 hours x 14 times	56
Practicals	90	1	Report	Practical: 1 hour x 12 practical	12
				Preparation and Follow up: 2 hours x 12 individual practical	24
Total Workload		134 hours			
Credit points		3 CU			
Requirements according to the examination regulations		Minimum attendance at lectures is 80% (according to ITB regulation). Final score is evaluated based on assignment, practical course report, and presence (20%), mid semester exam (40%), and end semester exam (40%)			
Recommended prerequisites		-			
Module objectives/intended learning outcomes		Students understand application of deterministic and statistic method for solving geological problem e.g. groundwater level decline due to water extraction.			
Content		This lecture focuses on the understanding of problem solving in geology by applying deterministic mathematical method with the aid of computer (computer programming)			
Study and examination requirements and forms of examination		Mid-term, final term, practical, and homework			
Media employed		Slide projector and computer			
Reading list		• Wang, H.F., dan Anderson, M.P., 1982, Introduction to Groundwater Modeling Finite Difference and Finite Element Methods, Academic Press, Inc. • Chapra, S.C., dan Canale, R.P., 2002, Numerical Methods for Engineers Fourth Edition, McGraw-Hill Companies, Inc. • Raharjo, B., 2007, Pemrograman C++, mudah dan cepat menjadi master C++, Penerbit Informatika, 442 halaman (dari Kuliah PTI-B) • www.cplusplus.com • User manual Codeblock			

Module name:		**Geomorphology**			
Module level, if applicable		3rd year			
Code, if applicable		GL 3111			
Semester(s) in which the module is taught		6th Semester			
Person responsible for the module		Dr. Ir. Agus Handoyo Harsolumakso			
Lecturer		Dr. Ir. Agus Handoyo Harsolumakso, Alfend Rudyawan S.T., M.T., Ph.D.			
Language		Indonesian			
Relation to curriculum		Compulsory			
Types of teaching and learning	Class Size	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Lecture and group discussion and presentation	80	2	Lecture and discussion	Lectures: 2 x 14	28
				Preparation and Follow up 4 x 14	56
Practical	80	1	Discussion and reporting	Lectures/discussion 1 x 14	14
				Individual reporting 2 x 14	28
Total Workload		126 hours			
Credit points		3 CU			
Requirements according to the examination regulations		Minimum attendance at lectures is 80% (according to ITB regulation). Final score is evaluated based on assignment and practical course report (40%), mid semester exam (25%), and end semester exam (35%))			
Recommended prerequisites		1. Petrology (prerequisite) 2. Principles of Stratigraphy (prerequisite) 3. Structural Geology (prerequisite) 4. Geomorphology (prerequisite)			
Module objectives/intended learning outcomes		Being able to understand the meaning of geomorphology, identify the type and shape of the landscape as well as the processes that take place. Capable and skilled in the analysis and interpretation of the geomorphology of the media topographic maps, aerial photographs, satellite images, with a variety of equipment.			
Content		Geomorphology is the study of landforms, processes that occur and formation, both inside (endogenous) and on the surface (exogenous) of the earth. Geomorphology is a reflection of the condition of lithology and geological structures, associated with the stage of the surface such as weathering, erosion and sedimentation, which gives an overview of landscape characteristics. In studying geomorphology, beside of field observations, another analysis is used such as topographic maps, aerial photographs and a variety of remotely sensed imagery. This analysis includes the technique of using aerial photographs and imagery from aircraft or satellites, processing and interpretation of visual or digital way.			

	Some aspects that will be discussed in this course: 1. Introduction into geomorphology 2. Exogenous geomorphic process 3. Endogenous geomorphic process 4. Geomorphic element and identification to geomorphological object 5. Folded mountain and plateau 6. Volcanoes and dome 7. Fluvial plain 8. Coastal, swamp, and deltas 9. Karst morphology 10. Complex, block, and structural mountains 11. Geomorphology mapping 12. Modern geomorphology 13. Applied geomorphology
Study and examination requirements and forms of examination	Paper examination for both theories and practical
Media employed	Paper and presentation
Reading list	1. Thornburry, 1989, Principles of Geomorphology 2. van Zuidam, 1985, Guide to Geomorphologic Aerial Photo 3. Floyd F. Sabins, Remote Sensing, Principles and Interpretation, Freeman 3rd Edition, 1997. 4. Geomorphology and Photo Interpretation, USGS.

Module name:	**Optical Mineralogy and Petrography**				
Module level, if applicable	3rd year				
Code, if applicable	GL 3141				
Semester(s) in which the module is taught	5th semester				
Person responsible for the module	Ir. Nurcahyo Indro Basuki, M.T., Ph.D.				
Lecturer	Ir. Nurcahyo Indro Basuki, M.T., Ph.D.				
Language	Indonesian				
Relation to curriculum	Compulsory				
Types of teaching and learning	Compulsory Course	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Lecture	80	2	Lecture and discussion	Lectures	28
				Preparation and Follow up	56
Practical	12	1	Microscopic observation and Report	Practical	12
				Preparation and Follow up	24
Total Workload	120 hours				
Credit points	3 CU				
Requirements according to the examination regulations	Minimum attendance in class is 80% (according to ITB regulation). Final score is evaluated based on course score (70%) and practical report score (30%). Course score consist of mid exam (25%), final exam (40%), quiz (10%) and assignments (25%)				
Recommended prerequisites	GL2141 Crystallography and Mineralogy (pre-requisites), GL2242 Petrology (pre-requisites)				
Related course	GL3045 Rock Forming Minerals (elective), GL3044 Petrogenesis (elective)				
Module objectives/intended learning outcomes	1. Students will be able to explain optical phenomena when light wave goes through non-opaque minerals and how these phenomena can be characteristics of various rock-forming minerals. 2. Students will be able to carry out petrographic observation techniques using polarized microscope. 3. Students will be able to identify various rock-forming minerals, and classify various and common igneous, sedimentary and metamorphic rocks based on their mineralogy and textures. 4. Students will be able to generate mineralogy and textural interpretation to determine rock-forming processes.				
Content	This course will discuss optical phenomena when light wave goes through non-opaque minerals and how these phenomena can be characteristics of various rock-forming minerals. Techniques to observe and identify rock-forming minerals and various rock types using polarized microscope will be comprehensively discussed. Furthermore, mineralogy and textures of various rock types (i.e. igneous, sedimentary, metamorphic rocks) and how to classify them will be covered. Mineralogy and textural interpretation to determine rock-forming processes will also be briefly discussed. This course includes weekly laboratory work				

	that will give students the opportunity to learn about optical characteristics of rock-forming minerals as well as mineralogy and texture characteristics of different rock types based on thin section observation using polarized microscope. The lectures give an overview of following topics: 1. Theory of light and Polarizing microscope 2. Isotropic and Anisotropic Optical Indicatrix 3. Orthoscopic observation, plane polarized light: shape, habit, refraction index, relief, color, pleochroic 4. Orthoscopic observation, crossed-polarizers: birefringence, interference color, sign of elongation, extinction 5. Conoscopic observation: uniaxial and biaxial optics 6. Identification of Minerals 7. Petrography of Igneous Rocks: Ultramafic, Mafic, Intermediate, Acid and Pyroclastic Rocks 8. Petrography of Sedimentary Rocks: Siliciclastic and Carbonate Rocks 9. Petrography of Metamorphic Rocks
Study and examination requirements and forms of examination	Paper-based exams (mid semester and final), quiz, assignments and Practical Test
Media employed	Writing on board, power point, movie (limited), articles/papers, thin sections
Reading list	1. Kerr. P.F. 1977. Optical Mineralogy, 4th ed. Mc Graw Hill Book Coy. 492 p. 2. Nesse, W.D., 2004. Introduction to Optical Mineralogy. 3rd ed. Oxford University Press, New York, 348 p. 3. Deer et al. 1979 (Second Impression). An Introduction to the Rock-Forming Minerals. E L B S and Longman. 528 p. 4. Williams, H., Turner, F.J., and Gilbert, C.M., 1982. Petrography, an introduction to the study of rocks in thin sections. 2nd ed. W.H. Freeman and Co., New York, 626 p 5. Ehlers, G.E., dan Blat, H., 1982, Petrology, W.H. Freeman and Co., San Francisco, 732 p. 6. Fischer, R.V. and Schmincke, H.U., 1984, Pyroclastic rocks, Springer-Verlag, San Francisco, 472 p.

Module name:	**Volcanology and Geothermal**				
Module level, if applicable	3rd year				
Code, if applicable	GL3142				
Semester(s) in which the module is taught	5th semester				
Person responsible for the module	Dr. I Gusti Bagus Eddy Sucipta, ST., MT.				
Lecturer	Dr. I Gusti Bagus Eddy Sucipta, ST., MT.; Dr. Eng. Mirzam Abdurrahman, ST., MT.; and Dr. Eng. Asep Saepuloh, ST., M.Sc.				
Language	Indonesian				
Relation to curriculum	Compulsory Course				
Types of teaching and learning	Class Size	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Lecture	80	2	Lecture, discussion, and group projects	Lectures	28
				Preparation and Follow up	56
Total Workload	84 hours				
Credit points	2 CU				
Requirements according to the examination regulations	Minimum attendance at lectures is 80% (according to ITB regulation). Final score is evaluated based on mid semester exam (30%), end semester exam (40%), group assignment (20%), and quiz (10%),				
Recommended prerequisites	GL2111 Physical Geology (pre-requisite), GL2213 Tectonophysics (pre-requisite), and GL2242 Petrology (pre-requisite)				
Related Course	GL4042 Geology Geothermal (elective)				
Module objectives/intended learning outcomes	1. Students understand the volcanological science and geothermal systems. 2. Students understand the volcanological aspects especially in Indonesia and the world at large scale. 3. Students understand the conceptual model of geothermal systems and get to know some methods of exploration.				
Content	The lecture examines the tectonic position of volcanoes, their eruption, classification, magmatic formation, chemical and physical aspects, heat flow, hazards mitigation, volcano stratigraphic, and survey methods in the fields. The lecture also explains the relationship of volcanoes with geothermal, mineralization, and the aspects of human life included agriculture, tourisms. The lectures give an overview of following topics: 1. Introduction 2. Tectonic setting of volcanoes and magma formation 3. Classification, shape, and structure of volcanoes 4. Volcanoclastic deposits and lava flows 5. Mechanism of pyroclastic deposits, lahar, tephra, and pyroclastic flows 6. Geology of volcanoes 7. Field investigation methods of volcanoes 8. Mitigation on volcanic hazard 9. Magmatism and geothermal system 10. Exploration and benefits of geothermal energy				

	11. Geothermal system of caldera 12. Geochemistry survey in geothermal 13. Geothermal geophysics 14. Relationship of volcanoes and geothermal
Study and examination requirements and forms of examination	Paper Test and Group Presentation
Media employed	White board, computer, projector, reference paper, maps
Reading list	1. Wohletz, K. and Heiken, G., 1992, Volcanology and geothermal energy, University of California Press, Berkeley - Los Angeles, 432 p. 2. Fisher, R. V., Heiken, G., and Hullen, J. B., 1998, Volcanoes: Crucibles of change, Princeton Univ. Press, New Jersey, 317 p. 3. Kusumadinata, K., 1979, Data dasar gunungapi di Indonesia, Direktorat Volkanologi, Bandung, 820 p 4. Schmincke, H-U., 2005, Volcanism, Springer, Verlag Berlin, 324 p. 5. Fischer, R.V. and Schmincke, H.U., 1984, Pyroclastic rocks, Springer-Verlag, San Francisco, 472 p. 6. Cas, R .A. F. And Wright, J. V., 1988, Volcanic successions; : Modern and ancient, Unwin Hyman, London, 528 p 7. Yuwono,Y.S., 2004, Pemetaan daerah volkanik: Panduan untuk pemetaan lapangan, Penerbit ITB, Bandung, 77 p. 8. Bignami C., Bosi V., Costantivi L., Lavigne F., and Thierry P., 2012, Handbook for Volcanic Risk Management, Prevention, Crisis Management, and Resilience, Miavita – Library of Congress Cataloging, Orlean-France, 197 p. 9. van der Meer F. , Hecker C., van Ruitenbeek F., van der Werff H., de Wijkerslooth C., Wechsler C., 2014, Geologic remote sensing for geothermal exploration: A review, International Journal of Applied Earth Observation and Geoinformation, Elsevier, 15 p. 10. Lowrie, W., 2007, Fundamentals of Geophysics, Cambridge University Press, Cambridge - London, 381 p.

Module name:	**General Hydrogeology**				
Module level, if applicable	3rd year				
Code, if applicable	GL 3181				
Semester(s) in which the module is taught	Every Semester				
Person responsible for the module	Dr. Dasapta Erwin Irawan, S.T., M.T.				
Lecturer	Dr. Dasapta Erwin Irawan, S.T., M.T. and Prof. Dr. Ir. Deny Juanda Puradimaja, DEA				
Language	Indonesian				
Relation to curriculum	Compulsory Course				
Types of teaching and learning	Class Size	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Lecture	80	2	Lecture and discussion	Lectures	28
				Preparation and Follow up	56
Practical	12	1	Report	Practical	12
				Preparation and Follow up	24
Total Workload	120 hours				
Credit points	3 CU				
Requirements according to the examination regulations	Minimum attendance at lectures is 80% (according to ITB regulation). Final score is evaluated based exams				
Recommended prerequisites	1. Physical Geology 2. Geofluids				
Module objectives/intended learning outcomes	Produce students who understand: 1. Principles of hydrogeology, 2. The role of the geological conditions in the presence of groundwater control and flow patterns. Students are able to apply: 1. Principles of hydrogeology, 2. The role of the geological conditions in the presence of groundwater control and flow patterns. 3. Basic analysis in hydrogeological mapping in the field.				
Content	This course covers the principles of hydrogeology, including hydrological cycle, rain and surface water as source of groundwater, geological control to aquifer system, exploration techniques, hydrodynamic behavior of groundwater, numerical simulation, hydrochemistry, hydrogeological basin, groundwater law. Some aspects that will be discussed in this course: 1. Introduction into principles of hydrogeology 2. Hydrologic cycle, precipitation and surface water as main source of groundwater 3. Aquifer system and groundwater potential 4. Aquifer system and groundwater potential in sedimentary rocks system 5. Aquifer system and groundwater potential in alluvial system 6. Aquifer system and groundwater potential in volcanic deposits system 7. Aquifer system and groundwater potential in igneous and				

	metamorphic rock system 8. Groundwater and aquifer properties 9. Exploration in hydrogeology 10. Drilling techniques and well construction 11. Groundwater hydrodynamics and aquifer test 12. Math equation in hydrogeology 13. Groundwater modelling 14. Dispersion phenomena in groundwater 15. Hydrogeological basin analysis
Study and examination requirements and forms of examination	Paper Test
Media employed	Presentation Slides, field activity
Reading list	1. Mandel, S., Shiftan, Z.L., 1981, Groundwater resources: investigation and development, Academic Press, Inc. 2. Freeze, RA dan Cherry, JA., 1979, Groundwater, Prentice Hall 3. Fetter, CW, 1994, Applied hydrogeology, 2nd ed, Prentice Hall 4. Todd, DK, 1980, Groundwater hydrology, John Wiley and Sons 5. Erdelyi, M. dan Galfi,J., 1989, Surface and subsurface mapping in hydrogeology, John Wiley & Sons

Module name:	**Reference Study**				
Module level, if applicable	3rd year				
Code, if applicable	GL 3191				
Semester(s) in which the module is taught	First semester				
Person responsible for the module	Dr. Ir. Budi Brahmantyo, M.Sc				
Lecturer	Dr. Ir. Budi Brahmantyo, M.Sc				
Language	Indonesian				
Relation to curriculum	Compulsory Course				
Types of teaching and learning	Class Size	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Lecture (5 meetings)	80	2	Lecture and discussion	Lecture	10
				Preparation and Follow Up	20
Presentation (9 meetings)	80	2	Presentation and discussion	Presentation	18
				Preparation and Follow Up	36
Total Workload	84 hours				
Credit points	2 CU				
Requirements according to the examination regulations	Minimum attendance at lectures is 80% (according to ITB regulation).				
Recommended prerequisites	1. Tectonophysics 2. Petrology 3. Structural Geology 4. Principles of Stratigraphy				
Module objectives/intended learning outcomes	In this lecture, students will be given lectures with the aim to: 1. Understand aspects of the study of literature / references; searching the literature, write a resume. 2. Understand the rules and ways of writing scientific papers about geology in Bahasa in good and right way, such as: abstract, introduction, analysis, discussion, conclusions. How to cite and reference, footnotes or end, tables, picture, maps, etc. 3. Being able to write a paper based on the study of literature. 4. Being able to present a good presentation with limited time management; and understand geological problems presented Students understand how to make geological papers, preparing presentation materials and have the experience and skills to present it with a good display, including a discussion and answer questions.				
Content	Reference Study I is a student seminar by presenting scientific geological paper with references from published papers within the last 10 years' journals/proceedings. In the beginning of the program, the students will be have a lecture how to look for and to collect references, how to make resume and how to re-write as scientific paper and make a presentation. The lectures also give presentation technics and skills and how to earn successful presentation. There will be only several lectures, in the end students will present their paper in front of their friends and lecturer. Some aspects that will be discussed in this course:				

	1. Introduction 2. Presentation planning 3. Presentation preparation and techniques 4. Evaluation of students presentation
Study and examination requirements and forms of examination	Paper and Presentation
Media employed	Power point slides
Reading list	1. Berko, R.M., A.D. Wolvin, dan D.R. Wolvin, 1989, communicating (4th Ed.), Houghton Mifflin Co., Boston. 2. Adler, R.B., L.B. Tosenfeld, dan N. Towne, 1992, Interplay The Process of Interpersonal Communication (5th ed.), Harcourt Brace Jovanovich Coll. Publ., Fort Worth. 3. Ong, H.L., 1999, Cara Memberikan Presentasi Yang Efektif Dengan Contoh-contoh di Bidang Geologi dan Pertambangan, Jur. Teknik Geologi, ITB. 4. Seksi Bahasa Indonesia, 1988, Bahasa Indonesia dan Tata Tulisan Karangan Ilmiah, Jur. MKDU ITB.

Module name:		**Geology of Indonesia**			
Module level, if applicable		3rd year			
Code, if applicable		GL 3203			
Semester(s) in which the module is taught		6th Semester			
Person responsible for the module		Dr. Ir. Chalid Idham Abdullah			
Lecturer		Dr. Ir. Chalid Idham Abdullah			
Language		Indonesian			
Relation to curriculum		Compulsory			
Types of teaching and learning	Class Size	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Lecture and group discussion and presentation	80	2	Lecture and discussion	Lectures: 2 x 14	28
				Preparation and Follow up 4 x 14	56
Total Workload		84 hours			
Credit points		2 CU			
Requirements according to the examination regulations		Minimum attendance at lectures is 80% (according to ITB regulation). Final score is evaluated based on assignment and practical course report (40%), mid semester exam (25%), and end semester exam (35%))			
Recommended prerequisites		1. Petrology (prerequisite) 2. Principles of Stratigraphy (prerequisite) 3. Structural Geology (prerequisite) 4. Geomorphology (prerequisite)			
Module objectives/intended learning outcomes		Lectures are given to refresh student's knowledge of tectonics with a view of its application in the geology of Indonesia. Students are able to make a connection between important geological information across Indonesia in order to make a sound review about geology around Indonesia.			
Content		Regional knowledge about tectonics, structure and, effect on sedimentation processes in the area of Indonesia. The concept of micro-continental zone which amalgamated become Sundaland. Configuration of terranes with its megasheares and the sutures. The discussion includes the tectonic-structures framework and stratigraphy, tectonic influenced basins framework, main stress patterns, geological features, tectonic and stratigraphic setting that different within islands in Indonesia. Some aspects that will be discussed in this course: 1. Introduction into geology of Indonesia 2. Geology of Western Indonesia 3. Geology of Sunda Shelf 4. Geology of Sumatera Islands 5. Geology of Java and Madura 6. Geology of Borneo 7. Geology of Eastern Indonesia 8. Geology of Sulawesi			

	9. Geology of Bali and West Nusa Tenggara 10. Geology of East Nusa Tenggara 11. Geology of Sumba 12. Geology of Timor 13. Geology of Papua 14. Geology of Banda Sea and Sahul Shelf
Study and examination requirements and forms of examination	Paper examination and presentation
Media employed	Paper and presentation
Reading list	1. Campton, 2004, Field Geology 2. Geologi ITB, 2002, Buku Pedoman Geologi Lapangan, Teknik-Geologi FIKTM-ITB 3. Hamblin, 1990, The Earth Dynamic System, McMilan Publ Co, 4. Maley, T, 1994, Field Geology Illustrated, MineralLand Publications, Idaho, USA, 316p

Module name:		**Field Geology (Karangsambung Field Camp)**			
Module level, if applicable		3rd year			
Code, if applicable		GL 3204			
Semester(s) in which the module is taught		6th Semester			
Person responsible for the module		Chalid Idham Abdullah, Agus Handoyo Harsolumakso			
Lecturer		A team of lecturers			
Language		Indonesian			
Relation to curriculum		Compulsory			
Types of teaching and learning	Class Size	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Lecture and group discussion	80	2	Lecture and discussion	Lectures: 2 x 14	28
				Coordinated Fieldwork 3 x 14	42
Individual mapping	80		Briefing and preparation Mapping	Preparation and Follow up 4 x 14	56
				Mapping program 3 x 12	36
Total Workload		168 hours			
Credit points		4 CU			
Requirements according to the examination regulations		Minimum attendance at lectures is 80% (according to ITB regulation).			
Recommended prerequisites		1. Petrology (prerequisite) 2. Principles of Stratigraphy (prerequisite) 3. Structural Geology (prerequisite) 4. Geomorphology (prerequisite)			
Module objectives/intended learning outcomes		Lectures given with the aim of students understand the application of geology in the field, so as to carry out geological field work standard, as well as being able to make a geological map of an area and its report mapping results. Students are able do standard geological fieldwork and be able to make a geological map of an area and its report mapping result.			
Content		This lecture presents field-lecture to implement the obtained geological knowledge by doing direct observation on geological data at field. The field-lecture consists of standard field geological method such as morphological analysis, outcrop observation, sampling, make some geological section, stratigraphic measurement, analysis on structural geology, and geological mapping including report. Until now, the lecture is realized in LIPI Field Geological Campus in Karangsambung (Central Java). Some aspects that will be discussed in this course: 1. Introduction into field geology 2. Geomorphology analysis 3. Basic petrology for describing rocks 4. Principles of stratigraphy and sedimentology for measuring section 5. Basic of structural analysis 6. Basic of geological mapping 7. Fieldwork report techniques			

	8. Outcrops observation 9. Geological fieldwork 10. Geological mapping practical
Study and examination requirements and forms of examination	Geological, Geomorphological, Traverse Maps, Stratigraphic Column, Cross Section and sound geological interpretation
Media employed	Paper and presentation
Reading list	1. Campton, 2004, Field Geology 2. Geologi ITB, 2002, Buku Pedoman Geologi Lapangan, Teknik-Geologi FIKTM-ITB 3. Hamblin, 1990, The Earth Dynamic System, McMilan Publ Co, 4. Maley, T, 1994, Field Geology Illustrated, MineralLand Publications, Idaho, USA, 316p

Module name:		**Geological Information System**			
Module level, if applicable		3rd year			
Code, if applicable		GL 3205			
Semester(s) in which the module is taught		First semester			
Person responsible for the module		Dr. Ir. Asep Heri Patria Kesumajana, M.T.			
Lecturer		Dr. Ir. Asep Heri Patria Kesumajana, M.T.			
Language		Indonesian			
Relation to curriculum		Compulsory Course			
Types of teaching and learning	Class Size	Attendance time (hours per week per semester)	Forms of active participation	Workload	
lecture, practical,	85	2	Lecture and discussion	Lectures: 2 x 14	28
				Preparation and Follow up: 4 x 14	56
Practical, group projects	25	2	Report	Practical: 2 x 12	12
				Preparation and Follow up: 1 x 12	24
Total Workload		120 hours			
Credit points		2 CU			
Requirements according to the examination regulations		Minimum attendance at lectures is 80% (according to ITB regulation). Final score is evaluated based on assignment and practical course report (40%), mid semester exam (30%), and end semester exam (30%)			
Recommended prerequisites		1. Physical Geology (prerequisites) 2. Tectonophysics (prerequisites) 3. Structural Geology (prerequisites)			
Module objectives/intended learning outcomes		By following this course students are expected to understand the basic concepts of geographic information system (GIS) and can apply these concepts into geology problem. After attending this course students are expected to understand more about the process of data collection, manipulation and analysis, and display the geology and geoscience information in the form of Geological Information System			
Content		These lectures provide an introduction to geographic information system (GIS) and application of geographic concepts in the field of geology and earth science. To achieve such understanding requires knowledge about the elements contained in geographic information system (GIS), various types of data in the field of geology and earth science, the process of digitizing the data, and the data structure management, retrieval, processing and manipulation and data analysis. Some aspects that will be discussed in this course: 1. Introduction into GIS 2. Data structure 3. Data retrieval and data processing 4. Data management 5. Data manipulation and analysis			

	6. GIS product 7. GIS and remote sensing 8. Applied GIS for geology and earth science
Study and examination requirements and forms of examination	Minimum attendance at lectures is 80% (according to ITB Regulation) Paper test, Laboratory Final Project
Media employed	Computer laboratory, power point slides
Reading list	1. Star, J & Estes, John, 1990, Geographic Information System: an Introduction, Prentice Hall Inc. 2. Richard L. Bedell Jr., 1995, Continuing Education Manual on GIS for The Geosciences, Geological Society of America, New Orleans, Louisiana, 193 hal. 3. Fazal, Shahab., 2008, GIS Basics, New Age International (P) Ltd., Publishers, New Delhi, 339 hal. 4. Prahasta, Eddy. 2001. Konsep-konsep dasar Sistem Informasi Geografis. Penerbit Informatika Bandung. 5. Softwares Manual : Arc Info, Arc View, Map Info, Ilwis 6. Publikasi dan Laporan SIG

Module name:		**Engineering Geology**			
Module level, if applicable		3rd year			
Code, if applicable		GL 3221			
Semester(s) in which the module is taught		2nd semester			
Person responsible for the module		Dr. Eng. Imam Achmad Sadisun, S.T., M.T.			
Lecturer		Dr. Eng. Imam Achmad Sadisun, S.T., M.T.			
Language		Indonesian			
Relation to curriculum		Compulsory Course			
Types of teaching and learning	Class Size	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Lecture		2	Discussion, Quiz, Assignment	Attendance time	28
				Preparation and follow up	56
Pratical Course		1	Laboratory Test Report	Attendance time	12
				Preparation and follow up	24
Total Workload		126 hours			
Credit points		3 CU			
Requirements according to the examination regulations		Minimum attendance at lectures is 80% (according to ITB Regulation) Final score is evaluated based on quiz (5%), assignment (10%), laboratory test report (25%), mid semester exam (25%) and final semester exam (30%).			
Recommended prerequisites		1. Physical Geology (prerequisite) 2. Geomorphology (prerequisite) 3. Petrology (prerequisite) 4. Structural Geology (prerequisite)			
Module objectives/intended learning outcomes		Students are able to get: • A knowledge and understanding on the geological principles which will be put to practical use for engineering activities, • An understanding on the nature of geological materials (mainly rocks, soils, and water) in both the mechanics fundamentals and the applied engineering, • A knowledge on geological processes that potentially bother engineering activities or even result in natural disasters, • An understanding on the instrumentation techniques wheter for field (in-situ) or laboratory, investigation methods and engineering geological mapping methods. With a good geological knowledge and understanding, students will gain an ability to use geological data and information in a various engineering activities, as well as having the ability to provide solutions to the geological problems that may arise in engineering work.			
Content		This course gives a knowledge and understanding on the geological principles which will be put to practical use for engineering activities in relation to whether civil, mining, petroleum or environmental engineering. Emphasis will be placed on the importance of understanding on the nature of geological materials (mainly rocks, soils and water) in both the mechanics fundamentals and the applied			

	engineering. Some cases of geological processes that potentially bother engineering activities or even result in natural disasters will be also discussed. Moreover, the course will also cover the instrumentation techniques whether for field (in-situ) or laboratory, investigation methods and engineering geological mapping methods. Some aspects that will be discussed in this course: 1. Fundamental mechanics 2. Engineering aspect in rock, weathered rock and soil 3. Engineering aspect in sub-surface water 4. Engineering works on rock and soil 5. Geological process and hazard 6. Engineering geological investigation 7. Engineering geological mapping
Study and examination requirements and forms of examination	Paper test
Media employed	Slide presentation, animation, movie, laboratory test guideline
Reading list	1. Hencher, S.R., 2012. Practical Engineering Geology, CRC Press, 464 pp. 2. Price, D.G., 2009. Engineering Geology: Principle and Practice. Edited and Compiled by M. H. De Freitas, Springer, 450 pp. 3. Tony Waltham, 2009. Foundations of Engineering Geology, 3rd edition. New York: Spon Press. 4. Bell, F. G., 2007. Engineering Geology, 2nd Edition. Butterworth-Heinemann, Amsterdam, 581 pp.

Module name:	**Mineral Deposits**				
Module level, if applicable	3rd year				
Code, if applicable	GL3243				
Semester(s) in which the module is taught	6th semester				
Person responsible for the module	Ir. Nurcahyo Indro Basuki, M.T., Ph.D.				
Lecturer	Ir. Nurcahyo Indro Basuki, M.T., Ph.D.				
Language	Indonesian				
Relation to curriculum	Compulsory Course				
Types of teaching and learning	Class Size	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Lecture	80	2	Lecture and discussion	Lectures	28
				Preparation and Follow up	56
Practicals	12	1	Microscopic observation and Report	Practical	12
				Preparation and Follow up	24
Total Workload	120 hours				
Credit points	3 CU				
Requirements according to the examination regulations	Minimum attendance in class is 80% (according to ITB regulation). Final score is evaluated based on course score (70%) and practical report score (30%). Course score consist of mid exam (25%), final exam (40%), quiz (10%) and assignments (25%)				
Recommended prerequisites	GL2141 Crystallography and Mineralogy (pre-requisites), GL2242 Petrology (pre-requisites)				
Related Course	GL2012 Structural Geology (compulsory), GL4032 Geochemical Exploration (elective), GL4045 Mineral Deposits and Ore Minerals (elective)				
Module objectives/intended learning outcomes	1. Students will be able to distinguish various types of mineral deposits based on their characteristics. 2. Students will be able to carry out samples/outcrops observation and make description and interpretation based on their mineralogy and textures/structures. 3. Students will be able to explain the relationships between various mineral deposits and their tectonic setting. 4. Students will be able to describe how characteristics of different mineral deposits will affect their exploration concepts and methods				
Content	This course is to give basic understanding of various economic metal commodities related to different ore deposits that are sought and mined. Therefore, the course will discuss various types/models of ore deposits associated with igneous, sedimentary and metamorphic rocks, as well as surficial weathering-erosion processes. Geological, geochemical and geophysical characteristics of various types of ore deposits will also be covered. Topics on ore formation and general exploration concept will also be briefly discussed. This course includes weekly laboratory work that will give students the opportunity to learn about mineralogy and texture characteristics to different ore deposits based on hand-specimen sample observation.				

	The lectures give an overview of following topics: 1. Orthomagmatic deposits 2. Felsic rock-associated deposits (incl. pegmatite, greisen, porphyry types) 3. Epithermal, orogenic and exhalative deposits (incl. VHMS and Sedex) 4. Surficial-supergene-placer deposits 5. Mineral exploration
Study and examination requirements and forms of examination	Paper-based exams (mid semester and final), quiz, assignments and Practical Test
Media employed	Writing on board, power point, movie (limited), articles/papers, hand specimens
Reading list	1. Bateman AM & Jensen ML., (1981) Economic Mineral Deposits, Jhon Wiley & Sons, Singapore 2. Evans, AM, (1992) Ore Geology and Industrial Minerals, An Introduction, , Blackwel Sci. Pub., London 3. Guilbert, JM & Park, Jr. CF., (1986) The Geology of Ore Deposits, Freeman, NY. 4. Kirkham, RV, Sinclair, WD, Thorpe, RI, and Duke, JM, (1997), Mineral Deposit Modeling, Geological Association of Canada Special Paper 40. 5. Roberts, RG & Sheahan, PA, (1988), Ore Deposit Models, Geological Association of Canada. 6. Hedenquist JF, (1990), Epithermal Gold Mineralization of the Circum Pacific Vol I & II, Elsevier 7. Hedenquist, JW, Thompson, JFH, Goldfarb, RJ, & Richards, JP, (2005), Economic Geology 100th Anniversary Volume, Society of Economic Geologists, Inc. 8. Pirajno, F, 2009. Hydrothermal Processes and Mineral Systems. Springer Verlag, 1250 p.

Module name:	**Petroleum Geology**				
Module level, if applicable	3rd year				
Code, if applicable	GL 3251				
Semester(s) in which the module is taught	2nd semester				
Person responsible for the module	Dr. Ir. Dardji Noeradi				
Lecturer	Dr. Ir. Dardji Noeradi				
Language	Indonesian				
Relation to curriculum	Compulsory Course				
Types of teaching and learning	Class Size	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Lecture	80	2	Discussion	Lectures	28
				Preparation and Follow up	56
Practicum	20	1	Report Assignment Presentation	Practical	12
				Preparation and Follow up	24
Total Workload	120 hours				
Credit points	3 CU				
Requirements according to the examination regulations	Minimum attendance at lectures is 80% (according to ITB regulation). Final score is evaluated based on assignment and practical course report (20%), mid semester exam (40%), and end semester exam (40%).				
Recommended prerequisites	1. Sedimentology (prerequisite) 2. Principles of Stratigraphy (prerequisite) 3. Structural Geology (prerequisite)				
Module objectives/intended learning outcomes	Provide a basic understanding of petroleum existence in the earth's crust as well as the principles of the exploration. After following this course, the student is expected to know about: 1. Formation of oil and gas 2. Concept of oil and gas formation and accumulation 3. How geologist find oil and gas				
Content	The course discuss about Petroleum system which consists of elements and process within the system. Three sub-system which are; Generative sub-system, Migration sub-system and Entrapment sub-system will be discussed in detail. The Generative sub-system comprises of; source rocks identification and its condition, source rocks types and its relation to hydrocarbon potential and source rock maturities as well as the methods of maturity identification and modeling including kitchen definition. The Migration sub system discuss two aspects which are primary migration where hydrocarbon out from source rocks to carrier beds in the kitchen area and secondary migration within carrier bed from the kitchen to the available traps. The Entrapment sub system discuss about entrapment mechanism related to secondary migration, component of traps; geological condition, reservoir rock and seal rock, type of traps including; structural, stratigraphic and combination of both. Some aspects that will be discussed in this course:				

	1. Introduction into petroleum geology 2. Hydrocarbon definition 3. Human history of hydrocarbon 4. Hydrocarbon source rocks 5. Hydrocarbon migration 6. Reservoir 7. Hydrocarbon entrapment 8. Hydrocarbon system analysis inside the basin 9. Lead, prospect, and drilling prognosis 10. Measuring resource and geological risk 11. Structural and isopach mapping 12. Resources Measuring
Study and examination requirements and forms of examination	Paper Test and Studio Activity
Media employed	Presentation slides, studio activity
Reading list	1. North F.K (1985), Petroleum Geology Allen & Unwin, London, Sydney 2. Magoon B.and Dow G. AAPG memoir no. 60 1994; The Petroleum System from Source to Trap. 3. Diana Morton-Thompson, 1992. Development Geology Reference Manual, AAPG Methods in Exploration Series, N0 10

Module name:	**Historical Geology**				
Module level, if applicable	3rd year				
Code, if applicable	GL 3271				
Semester(s) in which the module is taught	2nd semester				
Person responsible for the module	Dr. Ir. Yan Rizal R., Dipl. Geol. and Dr. Aswan ST., MT.				
Lecturer	Prof. Dr. Ir. Yahdi Zaim; Dr. Ir. Yan Rizal R., Dipl. Geol.; Dr. Aswan ST., MT.; Mika Rizki Puspaningrum, S.Si., M.T.				
Language	Indonesian				
Relation to curriculum	compulsory course				
Types of teaching and learning	Class Size	Attendance time (hours per week per semester)	Forms of active participation	Workload	
lecture and group presentation	2 x 45	2	quiz, discussion, assignment, group presentation	Lectures: 28 hours (2 hours x 14 weeks)	28
				Preparation and Follow up: 56 hours (4 hours x 14 weeks)	56
Total Workload	84 hours				
Credit points	2 CU				
Requirements according to the examination regulations	Minimum attendance at lectures is 80% (according to ITB regulation). Final score is evaluated based on assignment and group presentation (30%), mid semester exam (35%), and end semester exam (35%)				
Recommended prerequisites	1. Physical Geology 2. Structural Geology 3. Petrology 4. Sedimentology 5. Principles of Stratigraphy 6. Paleontology				
Module objectives/intended learning outcomes	Students be able to understand the establishment, evolution and dynamics process of the earth within time and space, the sedimentation/climatic history, the evolution of organisms and the implication for resource/economic/hazard potential yielded by the Earth.				
Content	This module explains the basic / philosophy of the earth formation in the solar system, as well as of the basic concepts of the theories in geology (geosyncline, continental drift and plate tectonics). The module also includes the basic understanding of the earth composition and it distribution by geological processes and aspects of life / evolution in space and time, including the meaning of geological processes on the development of life and evolution. This module also explains the tectonic development, fauna and flora and their environment of all time (Paleozoic - Quaternary), important events during the Earth history, as well as its significance for the exploration of resources/economic/geohazard, especially in Indonesia. Discuss the existence of hominid Homo erectus and vertebrates in Indonesia as well as the reconstruction of the paleo-environment during the Quaternary Period in Indonesia and Asia.				

	Some aspects that will be discussed in this course: 1. Earth formation concept 2. The development of theories of geological processes 3. Methods in geological dating 4. Basin history 5. Geological time scale 6. The evolution of flora and fauna, and the correlation with geodynamics and climate 7. Earth during between the Precambrian and Early Paleozoic 8. Earth during the Late Paleozoic 9. Earth during Cenozoic 10. Earth during Neogene 11. Earth during Quaternary
Study and examination requirements and forms of examination	Paper Test and Group Presentation
Media employed	presentation slides, movie
Reading list	1. Kummel, B., History of the Earth, Freeman & Co, 1961 (main) 2. Read and Watson , Introduction to Geology: Earth History, Vol 1 & 2, McMillan, 1978 (main) 3. Stanley S.M., Historische Geologie, Spektrum Akademischer Verlag, Heidelberg. Berlin, 2001 (main) 4. Nichol G., Sedimentology and Stratigraphy, second ed., Wiley-Blackwell, 2009 (additional) 5. Van Bemmelen R.W., The Geology of Indonesia, Martinus Nijhoff,The Hague, 1949 (additional) 6. Watanabe N., Kadar D., Quaternary Geology of the Hominid Fossil Bearing Formation in Java, GRDC, 1985 (additional)

Module name:	**Methods on Geological Exploration**				
Module level, if applicable	3rd year				
Code, if applicable	GL 4101				
Semester(s) in which the module is taught	1st Semester				
Person responsible for the module	Dr. Ir. Prihadi Sumintadireja				
Lecturer	Dr. Ir. Prihadi Sumintadireja				
Language	Indonesian				
Relation to curriculum	Compulsory Course				
Types of teaching and learning	Class Size	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Lecture	80	2	Discussion	Lectures	28
				Preparation and Follow up	56
Practicum	40	1	Report Assignment Presentation	Practical	12
				Preparation and Follow up	24
Total Workload	120 hours				
Credit points	3 CU				
Requirements according to the examination regulations	Attendance at lectures is 80% Assignment and Presentation 20% Mid Semester Exam 30% End Semester Exam 30% Practical Laboratory 20%				
Recommended prerequisites	Petrology, Stratigraphy and Sedimentology, Structural Geology				
Module objectives/intended learning outcomes	Student are able to understand the basic understanding of the exploration activities covering concepts, principles, planning and exploration stages as well as the implementation of the exploration methods. Students are able to perform these steps in an integrated geological exploration to the estimation of reserves				
Content	Discussion the course outline includes concepts exploration, followed by planning and technical exploration. In the technical section exploration discussed models and stages exploration and models exploration. Model exploration taught include geological models and geophysical models following methods geology and geophysical common used. survey methods geology, geological investigation local, exploration drilling, seismic, gravity, geoelectric (IP), geomagnetic				
Study and examination requirements and forms of examination	Type of test is given in this course is a group presentation and paper test				
Media employed	Slides and LCD Projectors, White/Blackboards				
Reading list	Relevant reading for this course uses literature from: 1. Applied Mining Geology, Springer, 2016 2. Reynolds, J.M., An Introduction to Applied an Environmental Geophysics, John Wiley & Sons, 1997 3. Telford, W.M., L.P. Geldart, R.E, Sheriff, Applied Geophysics, Cambridge University, 1990				