SEMESTER LEARNING ACTIVITY PLANS (SLAP)
SEMESTER ODD 2022/2023

Advanced Geothermal Exploration

MFF5881 / 2 Credits

Lecturer Coordinator:

Dr.rer.nat. Sintia Windhi Niasari, M.Eng.

UNIVERSITAS GADJAH MADA
FACULTY OF MATHEMATICS AND NATURAL SCIENCE

2022

	Universitas Gadjah Mada Faculty of Mathematics and Natural Science Physics Department / Study Program Master Physics Semester Odd 2022/2023

SEMESTER LEARNING ACTIVITY PLANS (SLAP)

Code	Course Name	Credits (credits)	Semester	Status	Prerequisite
MFF5881	*Advanced Geothermal Exploration*	*2*	*Odd*	*Elective*	*None*

Short Description	Advanced Geothermal Exploration course is Elective course 2 credits (Theory) in the 2022 Curriculum Master Physics Study Program, Faculty of Mathematics and Natural Science UGM. The syllabus of this course is as follows: Geothermal exploration includes about (1) geological control of the distribution and nature of geothermal systems; (2) the main types of geothermal systems and how energy is harnessed using the latest technology; (3) the potential of geothermal resources that can provide useful energy; and (4) geophysical methods that can be used for potential geothermal mapping. Geological influence on character and reservoir volume; and how to design surveys, conduct data collection, process modeling, and interpret geophysical data for geothermal exploration. The courses are held in class for 14 weeks, each week's session last for 2 x 50 minutes. Four weeks of course period is used for Midterm Exam and Final Exam, each held for two weeks as scheduled. Student evaluation for course assessments is performed summative and formative. The summative evaluation is implemented as written exams, both Midterm and Final Exam, which take a maximum of 120 minutes. The formative evaluation is implemented as individual assignments for each student in the form of completing an assignment individually. Monitoring is carried out by observing student activities during the course, such as attendance, Q&A and discussion about the material presented, and student performance in completing individual assignments.
Program Learning Outcomes (PLO) Imposed on the Course	(see table below)

PLO 2	Having the professional ability of a scientist.
PLO 3	Mastering further knowledge of classical and modern physics theory, and its relationship with other disciplines, and has mastered an advanced field of physics specialization that allows him to keep up with the latest international research developments.
PLO 4	Mastering various mathematical disciplines related to an advanced field of physics, and able to develop physical models using various mathematical and computational tools with an inter or multidisciplinary approach to solving problems related to an advanced field of physics.
PLO 6	Able to apply knowledge to analyze, synthesize, formulate problems and solve problems comprehensively in one of advanced field of physics, through experimental or theoretical research, then be able to classify and draw conclusions about their findings for the development of science and technology.

Course Outcomes (CO)	**Upon completion of this course, students should be able to:**			
	CO1	Know the elements of geothermal systems and geophysical methods used in geothermal exploration.		
	CO2	Build design surveys and conduct data collection, processing, modeling, and interpretation in the context of geothermal exploration.		
	CO3			
	CO4			
	CO5			
	CO6			
	CO7			
	CO8			
The Correlation of CO to Learning Materials and Methods, and Time Allocation		**Learning Materials**	**Learning Methods**	**Time Allocation**
	CO1	Introduction	Lecture	2 x 50 minutes
	CO1	Geothermal Geology	Lecture	2 x 50 minutes
	CO1	Geothermal Geochemistry	Lecture	2 x 50 minutes
	CO2	Case Study 1	Lecture	2 x 50 minutes
	CO2	Geothermal Geophysics	Lecture	2 x 50 minutes
	CO2	Case Study 2	Lecture	2 x 50 minutes
	CO2	Case Study 3	Lecture	2 x 50 minutes
	CO3	Case Study 4	Lecture	2 x 50 minutes
	CO3		Lecture	2 x 50 minutes
	CO3		Lecture	2 x 50 minutes
	CO4		Lecture	2 x 50 minutes
	CO4		Lecture	2 x 50 minutes
	CO4		Lecture	2 x 50 minutes
	CO4		Lecture	2 x 50 minutes
	Final Exam/ Project Task Results/ Case Analysis Results			
Learning Methods	Lecture			
Student Learning Experience	Learn to analyze and review: Introduction, Geothermal Geology, Geothermal Geochemistry, Case Study 1, Geothermal Geophysics, Case Study 2, Case Study 3, Case Study 4, , , , , , .			

<table>
<tr><td>Access to Learning Media/ LMS and Offline and Online Percentage</td><td colspan="4">Powerpoint</td></tr>
<tr><td>Assessment Methods and Synchronization with CO</td><td colspan="4">
<table>
<tr><th>Assessment Methods</th><th>Assessment Percentage</th><th>Criteria/Indicators</th><th>CO1</th><th>CO2</th><th>CO3</th><th>CO4</th></tr>
<tr><td>Participatory Activity*</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Project Results/ Case Study Results/ PBL Results*</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="7">Cognitive</td></tr>
<tr><td>Assignment</td><td>30%</td><td></td><td>7,5%</td><td>7,5%</td><td>7,5%</td><td>7,5%</td></tr>
<tr><td>Quiz</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Midterm Exam</td><td>35%</td><td></td><td>17,5%</td><td>17,5%</td><td></td><td></td></tr>
<tr><td>Final Exam</td><td>35%</td><td></td><td></td><td></td><td>17,5%</td><td>17,5%</td></tr>
<tr><td colspan="7">*) can also be obtained from the Midterm or Final Exam as the result of participatory activities or project/ case study results. According to IKU 7, the percentage of project results/ case study/ PBL results is at least 50%.</td></tr>
</table>
</td></tr>
<tr><td>References</td><td colspan="4">Main references:
1. Browne, P.R.L., 1978. Hydrothermal alteration in active geothermal fields. Annual Reviews Earth Planetary Sciences, 6, 229-250.
2. Browne, P.R.L., 1998. Hydrothermal alteration in New Zealand geothermal systems. In: Arehart&Hulston (Eds.), Water-Rock Interaction, Balkema, Rotterdam.
3. Browne, P.R.L., Rodgers, K.A.,2006. Occurrence and significance of anomalous chloride waters at the Orakeikorako geothermal field, Taupo Volcanic Zone, New Zealand.Geothermics, 35, 211-220.
4. Giggenbach, W.F., Glover, R.B., 1992. Tectonic regime and major processes governing the chemistry of water and gas discharges from the Rotorua geothermal field, New Zealand, Geothermics, 21, 121-140.
5. Giggenbach, W.F., Minissale, A.A.,Scadriffio, G., 1988. Isotopic and chemical assessment of geothermal potential of the Coli Albani area, Latium region, Italy. Applied Geochemistry, 3, 475-486.
6. Giggenbach, W.F. 1992. Isotopic shifts in waters from geothermal andvolcanic systems along convergent plate boundaries and their origin. Earth and Planetary Sceince Letters, 113, 495 – 510.</td></tr>
<tr><td>Lecturers (Team Teaching)</td><td colspan="4">1. Dr.rer.nat. Sintia Windhi Niasari, M.Eng.
2. Dr.rer.nat. Mochamad Nukman, S.T., M.Sc.
3.
4.</td></tr>
<tr><td>Authorization</td><td>Date of Drafting</td><td>Lecturer Coordinator</td><td>Head of Curriculum Committee</td><td>Head of Study Program</td></tr>
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