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

Petroleum Exploration

MFF5937 / 2 Credits

Lecturer Coordinator:

Prof. Dr. Sismanto, M.Si.

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
MFF5937	*Petroleum Exploration*	*2*	*Odd*	*Elective*	*None*

Short Description

Petroleum 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:
The origin of oil and gas and the types of oil and gas traps. Elements of the seismic survey: Stress and strain, Seismic waves, Body waves, Surface waves, Waves and rays, Seismic wave speed in rocks, and Seismic wave suppression along the wave's trajectory. The trajectory of the wave rays on the layered medium, Reflections, and usual assorted rays at a normal angle of arrival. Reflections and ordinations at the angle of the rays come with oblique, critical bias, and diffraction.
Reflection and ordinary surveys: seismic data acquisition system, seismic and acoustic sources of the spectrum, seismic sensors, recording systems. Reflector seismic surveys: Single flat reflector, Layered flat reflector, inclined reflector, multiple reflecting beam trajectories. Reflected seismogram: seismic trace, shot gather, CMP gathers. Multi-channel reflective survey design: Vertical and horizontal resolution, detector stretch design, CMP survey, reflective seismic data display. Time correction on seismic trace: static correction, speed analysis. Seismic data screening: Filter frequency, inversion (deconvolution), filter speed. Migration. 3D seismic survey. Interpret reflective seismic data: Structure analysis, Stratigraphy analysis, Sequence seismic modeling, Seismic attribute analysis.

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

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	Describes the propagation of reflective seismic waves for exploration/study of the existence of natural resources, especially oil and gas.		
	CO2	Determine, calculate, analyze, design acquisitions, and know seismic data processing steps.		
	CO3	Interpretate seismic data from processing results.		
	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: Explanation of syllabus material, course coverage and evaluation. Explanation of the SCL method, Energy Problems.	Lecture, discussion	2 x 50 minutes
	CO1	Rock incident	Lecture, discussion	2 x 50 minutes
	CO1	Origin of petroleum	Lecture, discussion	2 x 50 minutes
	CO2	Seismic wave propagation	Lecture, discussion	2 x 50 minutes
	CO2	Seismic Reflection Acquisition	Lecture, discussion	2 x 50 minutes
	CO2	Seismic Bias	Lecture, discussion	2 x 50 minutes
	CO2	Reflection Seismic Data Processing.	Lecture, discussion	2 x 50 minutes
	CO3	Wavelets and Synthetic Seismograms.	Lecture, discussion	2 x 50 minutes
	CO3	Static Correction and Speed Analysis.	Lecture, discussion	2 x 50 minutes
	CO3	Filtering	Lecture, discussion	2 x 50 minutes
	CO4	Migration	Lecture, discussion	2 x 50 minutes
	CO4	Seismic Data Interpretation	Lecture, discussion	2 x 50 minutes
	CO4	Seismic Data Modeling and Inversion.	Lecture, discussion	2 x 50 minutes

	CO4	Seismic Attributes	Lecture, discussion	2 x 50 minutes
	Final Exam/ Project Task Results/ Case Analysis Results			
Learning Methods	Lecture, discussion			
Student Learning Experience	Learn to analyze and review: Introduction: Explanation of syllabus material, course coverage and evaluation. Explanation of the SCL method, Energy Problems., Rock incident, Origin of petroleum, Seismic wave propagation, Seismic Reflection Acquisition , Seismic Bias, Reflection Seismic Data Processing., Wavelets and Synthetic Seismograms., Static Correction and Speed Analysis., Filtering, Migration, Seismic Data Interpretation, Seismic Data Modeling and Inversion., Seismic Attributes.			
Access to Learning Media/ LMS and Offline and Online Percentage	Whiteboard, LCD			

Assessment Methods and Synchronization with CO

Assessment Methods	**Assessment Percentage**	**Criteria/Indicators**	**CO1**	**CO2**	**CO3**	**CO4**
Participatory Activity*						
Project Results/ Case Study Results/ PBL Results*						
Cognitive						
Assignment	30%		7,5%	7,5%	7,5%	7,5%
Quiz						
Midterm Exam	35%		17,5%	17,5%		
Final Exam	35%				17,5%	17,5%

*) 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%.

References	**Main references:** 1. Sheriff R.E and Geldart L.P., 1995, Exploration Seismology, 2nd Ed, Cambridge. 2. Kearey P., Brooks M., and Hill I., 2002, An Introduction to GeophysicalExploration, 3rd Ed, Blackwell Science Ltd.
Lecturers (*Team Teaching*)	1. Prof. Dr. Sismanto, M.Si. 2. 3. 4.

Authorization	**Date of Drafting**	**Lecturer Coordinator**	**Head of Curriculum Committee**	**Head of Study Program**

		Prof. Dr. Sismanto, M.Si.	Dr.Ing. Ari Setiawan	Mirza Satriawan, M.Si., Ph.D