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

Advanced Rock Physics

MFF5916 / 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 Even 2022/2023

SEMESTER LEARNING ACTIVITY PLANS (SLAP)

Code	Course Name	Credits (credits)	Semester	Status	Prerequisite
MFF5916	*Advanced Rock Physics*	*2*	*Even*	*Elective*	*None*

Short Description

Advanced Rock Physics 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:
Basic concepts of rock properties are seen from physical parameters and can solve fundamental problems and problems of rock physical properties in an integrated and comprehensive manner. Matter Physics of rocks as part of earth science. Properties of porosity, permeability, internal surface, and density. Magnetic Properties of Rocks. Radioactivity of Rocks. The elasticity of Rocks. Seismic Wave Attenuation. Thermal Properties of Rocks. Electrical Properties of Rocks. Relationships Between Physical Properties of Rocks.

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 5	Able to plan, manage and carry out experiments and conclude the results, or be able to create and use modeling and simulations based on the basic principles of physics to study and solve a problem in a scientific field of Physics or applied Physics that produces models, methods, or theories tested and innovative.
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.

Upon completion of this course, students should be able to:

Course Outcomes (CO)	***CO1***	Understand and conceptualize the behaviour of rocks on various physical parameters and the relationship between physical parameters of one another.		
	CO2	Mastering the basic concepts of rock physical properties and solving problems with rock physical properties in an integrated and comprehensive manner.		
	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, discussion	2 x 50 minutes
	CO1	Rock Occurrence Process	Lecture, discussion	2 x 50 minutes
	CO1	Physical properties of planet earth (gravity, earth's magnetism, earth's revolution, isostasi theory).	Lecture, discussion	2 x 50 minutes
	CO2	Description of the physical properties of rock magnetism.	Lecture, discussion	2 x 50 minutes
	CO2	Exposure to the physical properties of rock radioactivity.	Lecture, discussion	2 x 50 minutes
	CO2	Description of the physical properties of rock elasticity.	Lecture, discussion	2 x 50 minutes
	CO2	Description of the physical properties of rock wave propagation.	Lecture, discussion	2 x 50 minutes
	CO3	Presentation/presentation of the physical properties of Voigt, Reuss theoretical models and their combinations as well as lamination and Time-Average models.	Lecture, discussion	2 x 50 minutes
	CO3	Presentation/presentation of physical properties of Laminated solid and fracture models.	Lecture, discussion	2 x 50 minutes
	CO3	Presentation/presentation of the concept of the ball container model and the Gassaman Model.	Lecture, discussion	2 x 50 minutes
	CO4	Presentation/presentation of the physical properties of the Biot and Geertsma Smit model concepts. Inclusion models.	Lecture, discussion	2 x 50 minutes
	CO4	Presentation/presentation of the bounds concept model, and the internal structure model.	Lecture, discussion	2 x 50 minutes
	CO4	Exposure/presentation of thermal and electrical physical properties.	Lecture, discussion	2 x 50 minutes

	CO4	Exposure/presentation of the relationship between the physical properties of rocks.	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, Rock Occurrence Process, Physical properties of planet earth (gravity, earth's magnetism, earth's revolution, isostasi theory)., Description of the physical properties of rock magnetism., Exposure to the physical properties of rock radioactivity., Description of the physical properties of rock elasticity., Description of the physical properties of rock wave propagation., Presentation/presentation of the physical properties of Voigt, Reuss theoretical models and their combinations as well as lamination and Time-Average models., Presentation/presentation of physical properties of Laminated solid and fracture models., Presentation/presentation of the concept of the ball container model and the Gassaman Model., Presentation/presentation of the physical properties of the Biot and Geertsma Smit model concepts. Inclusion models., Presentation/presentation of the bounds concept model, and the internal structure model., Exposure/presentation of thermal and electrical physical properties., Exposure/presentation of the relationship between the physical properties of rocks..			
Access to Learning Media/ LMS and Offline and Online Percentage	LCD, whiteboard			

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. Schon, J.H., 1998, Physical Properties of Rocks, Pergamon Press. 2. Guegen, Y and Palciauskas, V., 1994, Introduction to the Physics of Rocks,Princenton University Press. 3. Mavko, G, Mukerji, T, and Dvorkin, J., 1999, The rock Physics Handbook. Cambridge University Press.
Lecturers	1. Prof. Dr. Sismanto, M.Si.

(*Team Teaching*)	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