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

Advanced Seismic Imaging

MFF5880 / 2 Credits

Lecturer Coordinator:

UNIVERSITAS GADJAH MADA
FACULTY OF MATHEMATICS AND NATURAL SCIENCE
2022

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

SEMESTER LEARNING ACTIVITY PLANS (SLAP)

Code	Course Name	Credits (credits)	Semester	Status	Prerequisite
MFF5880	*Advanced Seismic Imaging*	*2*	*Even*	*Elective*	*None*

Short Description

Advanced Seismic Imaging course is Elective course 2 credits (Theory) in the 2022 Curriculum Master of Physics Study Program, Faculty of Mathematics and Natural Science UGM.

The syllabus of this course is as follows:
Rock physics for seismic modelling, Rock properties and Amplitude versus offset (AVO) analysis, Seismic trace inversion, AVO Inversion, Methodology, Full Waveform Inversion (FWI), initial modeling (travel-time tomography, reflection tomography, stereotomography), numerical methods of seismic wave modeling (finite difference, finite element, discontinuous galerkin finite element, spectral element), selection of objective functions/misfits, gradient calculations using the adjoint method, techniques numerical optimization for FWI.

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	Understand and explain advanced seismic imaging methodologies.		
	CO2	Carry out advanced seismic data processing and analyze the results.		
	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			2 x 50 minutes
	CO1			2 x 50 minutes
	CO1			2 x 50 minutes
	CO2			2 x 50 minutes
	CO2			2 x 50 minutes
	CO2			2 x 50 minutes
	CO2			2 x 50 minutes
	CO3			2 x 50 minutes
	CO3			2 x 50 minutes
	CO3			2 x 50 minutes
	CO4			2 x 50 minutes
	CO4			2 x 50 minutes
	CO4			2 x 50 minutes
	CO4			2 x 50 minutes
	Final Exam/ Project Task Results/ Case Analysis Results			
Learning Methods				
Student Learning Experience	Learn to analyze and review: , , , , , , , , , , , , , .			
Access to Learning Media/ LMS				

and Offline and Online Percentage	
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. Simm, R. and Bacon, M. (2014), Seismic Amplitude: An Interpreter's Handbook, Cambridge University Press. 2. Wang, Y., (2003), seismic amplitude inversion in reflection tomography, Pergamon, Elsevier science ltd. 3. Avseth, P., Mukerji, T., and Mavko, G. (2005), Quantitative seismic Interpretation , Cambridge University Press. 4. Virieux, J., Asnaashari, A., Brossier, R., Métivier, L., Ribodetti, A., & Zhou, W. (2017). An introduction to full waveform inversion. In Encyclopedia of exploration geophysics (pp. R1-1). Society of Exploration Geophysicists. 5. Fichtner, A. (2010). Full seismic waveform modelling and inversion. Springer Science & Business Media.
Lecturers (*Team Teaching*)	1. 2. 3. 4.

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