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

Potential Field Theory

MFF5932 / 3 Credits

Lecturer Coordinator:

Dr. Ing. Ari Setiawan, 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
MFF5932	*Potential Field Theory*	*3*	*Even*	*Elective*	*None*

Short Description

Potential Field Theory course is Elective course 3 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:
Potential field theory in general, Earth's gravitational field, Earth's magnetic field, gravitational and magnetic survey methods (gravimeter, magnetometer, gravitational and magnetic survey concepts, simplification for modeling purposes), gravitational/magnetic potential, Laplace and Poisson equations, Gauss equations, Stokes equations, and Greens equations. Equivalent stratum, a continuation of the potential field up and down, differentiation of the potential field, development of 2D and 3D multipole gravitational field, 2D and 3D excess mass calculation, 2D and 3D positioning of the center of mass excess, correction in the measurement of the gravitational field, reduction of data from an irregularly distributed topographical plane to a horizontal plane with data distribution in a grid, separation of regional and local effects, a downward continuation of the gravitational field for two- and more-than-two-layer models, depth determination, geoid.
Quantitative interpretation of the gravitational field: excess mass calculation, three-dimensional models, examples of interpretation with multipole expansion three-dimensional and two-dimensional models. Quantitative interpretation of magnetic fields: data correction, reduction to the horizontal plane, magnetic field anomalies, magnetic field continuity, demagnetization, tabular models, polygon models, examples of processing results of aeromagnetic surveys.

The courses are held in class for 14 weeks, each week's session last for 3 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 master the gravitational field and potential field.
	CO2	Master the concept of analytical methods for the interpretation of gravitational anomalies.
	CO3	Solve potential problems and gravitational acceleration.
	CO4	
	CO5	
	CO6	
	CO7	
	CO8	

The Correlation of CO to Learning Materials and Methods, and Time Allocation		**Learning Materials**	**Learning Methods**	**Time Allocation**
	CO1			3 x 50 minutes
	CO1			3 x 50 minutes
	CO1			3 x 50 minutes
	CO2			3 x 50 minutes
	CO2			3 x 50 minutes
	CO2			3 x 50 minutes
	CO2			3 x 50 minutes
	CO3			3 x 50 minutes
	CO3			3 x 50 minutes
	CO3			3 x 50 minutes
	CO4			3 x 50 minutes
	CO4			3 x 50 minutes
	CO4			3 x 50 minutes

	CO4			3 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. Baranov, W., 1975, Potential Fields and Their Transformations in Applied Geophysics, Grebuder Borntraege, Berlin-Stuttgart. 2. Grant, F.S. and West, G.F., 1965, Interpretation Theory in Applied Geophysics, McGraw-Hill. 3. La Fehr, Thomas R., and Misac N. Nabighian, 2012, Fundamentals of Gravity Exploration, SEG, The International Society of Exploration geophysicists. 4. S2-Physical Sciences Student, 2014-2017, Paper Assignment and Presentation. 5. Telford, M.W., et al, 1976, Applied Geophysics, Cambridge University Press.
Lecturers (*Team Teaching*)	1. Dr. Ing. Ari Setiawan, M.Si. 2. Dr. Budi Eka Nurcahya, M.Si. 3. 4.

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

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