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

Physics Undergraduate Study Program

Physics Department

Graphical Method in Physics

MFF 1064/ 2 Credits

Lecturer Coordinator:

Drs. Sunarta, MS.

UNIVERSITAS GADJAH MADA
FACULTY OF MATHEMATICS AND NATURAL SCIENCE
2022

<table>
<tr><td rowspan="2"><img>Universitas Gadjah Mada logo</img></td><td colspan="6">Universitas Gadjah Mada
Faculty of Mathematics and Natural Science
Physics Department / Physics Undergraduate Study Program
Semester EVEN 2022/2023</td></tr>
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colspan	**SEMESTER LEARNING ACTIVITY PLANS (SLAP)**				

Code	**Course Name**	**Credits (Credits)**		**Semester**	**Status**	**Prerequisite**
MFF 1064	*Graphical Method in Physics*	*T: 2*	*P: ...*	*EVEN*	*Elective*	*None*

Short Description	Graphical Method in Physics is an elective course; studying is to provide the ability to analyze experimental data using the observational graph analysis method. Linkages with other fields of science are complementary and perfect the knowledge of Measurement methods (in MPF compulsory courses). The outline of the study material in this course is understanding graphs as analytical graphs, starting with how to paint correctly, analyzing according to the resulting graphical characters, determining the magnitudes of the graphs that appear, calculating the measurement error/tolerance of the existing graphical quantities, and concluding the magnitudes The observed physical values of the existing graphical quantities. The benefits obtained by students and the strategic value for achieving graduate profiles are that by mastering this course, it is hoped that the profiles of graduates from the Physics study program are skilled at analyzing research data displayed in visual graphics.

Program Learning Outcomes (PLO) Imposed on the Course	*PLO 2*	Knowledge. Able to explain theoretical concepts and principles of classical and modern physics and able to apply basic concepts of physics and related mathematical methods in finding solutions to physical problems.
	PLO 5	Long Life Learning. Able to analyze various alternative solutions to physical problems and conclude them for appropriate decision-making, both in familiar and new problems.

Course Outcomes (CO)	**After completing this course, students are expected to be able to:**	
	CO1	Get an overview of the Analysis model graphically.
	CO2	Making graphs as a basis for analyzing observational data
	CO3	Draw the Analysis chart correctly.
	CO4	Calculate the values of the magnitudes and the values of the uncertainty of the graph quantities. Analyze accurately
	CO5	Analyze data with linear and quadratic graph models
	CO6	Analyze data with exponential graph models, calibrations, and hypotheses
	CO7	Converting non-linear data models to linear analysis
	CO8	Analyzing real data obtained from observations in the lab

The Correlation of CO to Learning Materials and Methods, and Time Allocation		**Learning Materials**	**Learning Methods**	**Time Allocation**
	CO 1, CO 2, CO 3	The importance/benefit of graphs in processing research data	TCL-SCL mixed	*2X50 minutes*
	CO 1, CO 2, CO 3	Method of Plotting Graph Analysis	TCL-SCL mixed	*2X50 minutes*
	CO 1, CO 2, CO 3	Calculating the values of graphical quantities (in general)	TCL-SCL mixed	*2X50 minutes*
	CO 4	Graph Error Analysis (in general)	TCL-SCL mixed	*2X50 minutes*

	CO 4	Linear Graph Analysis	TCL-SCL mixed	*2X50 minutes*
	CO 5	Quadratic Graph Analysis	TCL-SCL mixed	*4X50 minutes*
	Midterm exam/Project Task Results/Case Analysis Results			
	CO 6	Exponential Graph Model Analysis	TCL-SCL mixed	*2X50 minutes*
	CO 6	Analysis of the Calibration chart model	TCL-SCL mixed	*2X50 minutes*
	CO 6	Analysis of the Hypothesis Graph Model	TCL-SCL mixed	*2X50 minutes*
	CO 7, CO 8	Graph Linear Method	TCL-SCL mixed	*2X50 minutes*
	CO 7, CO 8	Testing Linear data analysis	TCL-SCL mixed	*2X50 minutes*
	CO 7, CO 8	Exponential Analysis data testing	TCL-SCL mixed	*2X50 minutes*
	CO 7, CO 8	Data testing Hypothesis analysis and calibration	TCL-SCL mixed	*2X50 minutes*
	Final exams/ Project Task Results/Case Analysis Results			

Learning Methods	**SCL (Student Centered Learning): Project-based learning (Team-based Project)/Case-based learning/PBL/other SCL methods**
Student Learning Experience	**Listen, ask, answer questions, and discuss**
Access to Learning Media/ LMS and Offline and Online Percentage	Offline (LCD, PPT Slide, Whiteboard, Laptop, unit mikrokontoler) and Online (Zoom Meeting, Google Meet, Google Classroom)

	Assessment Methods	Assessment Percentage	Criteria/ Indicators	CO 1	CO 2	CO 3	CO 4	CO 5	CO 6	CO 7	CO 8
Assessment Methods and Synchronization with CO	**Participatory Activity***										
	Project Results/ Case Study Results/ PBL Results*										
	Cognitive										
	Assignment	15		√	√	√	√	√	√	√	√
	Quiz	15		√	√	√	√	√	√	√	√
	Midterm Exam	35		√	√	√	√	√			
	Final Exam	35							√	√	√
	Total	**100**									
	*) 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. Buku : Modul Kuliah "Metode Analisa Grafik"-Sunarta, 2013. 2. Taylor, J. R.1992.An Introduction toError Analysis. University Science Book.California. 3. Bevington, P. R.1999.Data Reduction and Error Analysis for the Physical Science. Mc Graw-Hill Book Co. 4. Dulfer G, H & Fadeli., 1974. Metode Pengukuran & Analisa Data; FIPA-UGM..
Lecturers (***Team Teaching***)	1. Drs. Sunarta, MS.

Authorization	Date of Drafting	Lecturer Coordinator	Head of Curriculum Committee	Head of Study Program
		1. Drs. Sunarta, MS.		*Dr. Eng. Ahmad Kusumaatmaja, S.Si., M.Sc.*