SEMESTER LEARNING ACTIVITY PLANS (SLAP)

SEMESTER EVEN 2022/2023

Physics Undergraduate Study Program

Physics Department

Mathematical Physics II

MFF 1021/ 3 Credits

Lecturer Coordinator:

Dr. Prof. Agung B S Utomo, SU.
Dr. Ing. Ari Setiawan, M.Si.
Dr. Rinto Anugroho, NQZ, M.Si.

UNIVERSITAS GADJAH MADA
FACULTY OF MATHEMATICS AND NATURAL SCIENCE
2022

	Universitas Gadjah Mada Faculty of Mathematics and Natural Science Physics Department / Physics Undergraduate Study Program Semester EVEN 2022/2023	**Document Number :** ……

SEMESTER LEARNING ACTIVITY PLANS (SLAP)

Code	Course Name	Credits (Credits)		Semester	Status	Prerequisite
MFF 1021	*Mathematical Physics II*	*T: 3*	*P: …*	*EVEN*	*Compulsory*	*Basic Physics I (MFF1011), Mathematical Physics I (MFF1020)*

Short Description	The Mathematical Physics II course is compulsory for the Bachelor of Physics study program at Gadjah Mada University. This course can be taken by students in the odd semester of their second year of study with the approval of the instructor. Before taking this course, students are strongly advised to take the Calculus course. This is because in Mathematical Physics II (and Mathematical I and III), courses and Calculus is used as a foundation to understand Mathematics (for) Physics better to make it easier to understand Physics and Advanced Physics. By studying Mathematical Physics II (I and III) as an instrument, students are expected to understand better the theoretical foundations of various Physics and Advanced Physics phenomena.	
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 4	Special Skills. Able to design and carry out experiments/theoretical reviews, able to identify a physical problem based on the results of observations and experiments, and able to operate related technologies.
Course Outcomes (CO)	**After completing this course, students are expected to be able to:**	
	CO1	Can explain the concepts of matrices, determinants, special matrices, swavectors and self-values of a matrix, changes in basis, diagonals of matrices, systems of linear equations, and vector spaces.
	CO2	Can explain the Fourier Series and Complex Fourier Series, the Fourier transform and its properties, the uncertainty principle, and the Dirac delta.
	CO3	Can explain the Fourier series for odd and even functions, convolution, and deconvolution.
	CO4	Can explain the Fourier transform for high dimensions.
	CO5	Be able to explain the Laplace transform. Inversion of the Laplace transform and methods of solving differential equations with the Laplace transform.
	CO6	Can explain ordinary differential equations (equations of the first degree, equations of the second degree, answers with sequences: ordinary and singular points, series around ordinary points, rows around singular points),
	CO7	Can explain the press. Legendre, press. Hermite, press. Bessel, Etc.
	CO8	Can explain partial differential equations (boundary conditions, variable separation, Fourier analysis, diffusion equations, heat propagation, and waves.
	CO9	Can explain Integral Equations.

The Correlation of CO to Learning		Learning Materials	Learning Methods	Time Allocation
	CO 1	Matrix, determinant, special matrices, swavector and self-value of	TCL-SCL mixed	***3X50 minutes***

Materials and Methods, and Time Allocation		a matrix, the transformation of bases, diagonalization of a matrix, systems of linear equations, and vector spaces.		
	CO 1	Matrices, determinants, special matrices, swavectors and self-values of a matrix, changes in basis, matrix diagonals, systems of linear equations, and vector spaces.	TCL-SCL mixed	***3X50 minutes***
	CO 2	Fourier Series and Complex Fourier Series, Fourier transforms and their properties, uncertainty principle, Dirac delta.	TCL-SCL mixed	***3X50 minutes***
	CO 2	Fourier and Complex Fourier series, the Fourier transform and its properties, the uncertainty principle, and the Dirac delta.	TCL-SCL mixed	***3X50 minutes***
	CO 3	Series of Functions for Functions odd and even, convolution and deconvolution	TCL-SCL mixed	***3X50 minutes***
	CO 4	Fourier transform for high dimensions.	TCL-SCL mixed	***3X50 minutes***
	CO 5	Laplace transform (Laplace transform for derivatives and integrals, properties of Laplace transform).	TCL-SCL mixed	***3X50 minutes***
	Midterm exam/Project Task Results/Case Analysis Results			
	CO 5	Laplace transform (Laplace transform for derivatives and integrals, properties of Laplace transform).	TCL-SCL mixed	***3X50 minutes***
	CO 6	Ordinary differential equations (equations of degree one, equations of degree two, answers with sequences: ordinary and singular points, series around ordinary points, series around singular points.	TCL-SCL mixed	***3X50 minutes***
	CO 6	Ordinary differential equations (equations of degree one, equations of degree two, answers with sequences: ordinary and singular points, series around ordinary points, series around singular points.	TCL-SCL mixed	***3X50 minutes***
	CO 7	press. Legendre, press. Hermite, pers. Bessel, etc.	TCL-SCL mixed	***3X50 minutes***
	CO 8	Introduction to partial differential equations (boundary conditions, separation of variables, Fourier analysis, equations of diffusion and heat propagation, wave equations,	TCL-SCL mixed	***3X50 minutes***

	CO 8	Introduction to partial differential equations (boundary conditions, separation of variables, Fourier analysis, equations of diffusion and heat propagation, wave equations,	TCL-SCL mixed	***3X50 minutes***
	CO 9	Integral Equation	TCL-SCL mixed	***3X50 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 and understand, ask questions (discussion), download teaching materials (copy slides)**			
Access to Learning Media/ LMS and Offline and Online Percentage	Offline (LCD, PPT Slide, Whiteboard, Laptop) and Online (Zoom Meeting, Google Meet, Google Classroom)			

Assessment Methods and Synchronization with CO

Assessment Methods	Assessment Percentage	Criteria/ Indicators	CO								
			1	2	3	4	5	6	7	8	9
Participatory Activity*											
Project Results/ Case Study Results/ PBL Results*											
Cognitive											
Homework	**20**		√	√	√	√	√	√	√	√	√
Midterm Exam	**40**		√	√	√	√	√				
Final Exam	**40**							√	√	√	√
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. K. F. Riley, M. P. Hobson and S. J. Bence, 2006, Mathematical methods for physics and engineering, edisi ketiga, Cambridge Press..
2. Tom M. Apostol, Calculus, jilid I, edisi II, John Wiley & Sons, 1967.
3. Tom M. Apostol, Calculus, jilid II, edisi II, John Wiley & Sons, 1967..

Additional References:

1. Boas, M.L., 1983, Mathematical Methods in the Physical Sciences, edisi 2, John Willey & Sons, NY.
2. Thomas G.B. dan Finney R.L., 1995, Calculus and Analytic Geometry, Addison Wesley.

<table>
<tr><td>Lecturers (Team Teaching)</td><td colspan="4">1. Dr. Prof. Agung B S Utomo, SU.
2. Dr. Ing. Ari Setiawan, M.Si.
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