SEMESTER LEARNING ACTIVITY PLANS (SLAP)

SEMESTER ODD 2022/2023

Physics Undergraduate Study Program

Physics Department

Mathematical Physics III

MFF 2024/ 3 Credits

Lecturer Coordinator:

Muh. Farchani Rosyid

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 ODD 2022/2023	**Document Number :** ……

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Code	Course Name	Credits (Credits)		Semester	Status	Prerequisite
MFF 2024	*Mathematical Physics III*	*T: 3*	*P: …*	*ODD*	*Compulsory*	*Calculus I (MMM1101), Mathematical Physics I (MFF1020), Mathematical Physics II (MFF1021)*

Short Description	The Mathematical Physics III course continues the Mathematical Physics II course. The purpose of this course is for students to recognize and understand some of the typical and special functions and utilize these functions in several mathematical and physical problems. The contents of the Mathematical Physics II course are typical functions (Gamma, Beta, and Error functions), special functions (Legendre, Bessel, Hermite functions), complex variable functions (analytic functions, Taylor series, and Laurent series, residues, application of residues in integral calculations), and the calculus of variations. The learning method is to provide material and solve math and physics problems. In several meetings, students are given examples of simple problems to be solved together in class and then supplemented with additional assignments to do at home.	
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	Mastering and applying the basic concepts of typical functions.
	CO2	Mastering and applying special functions in solving simple math and physics problems.
	CO3	Understanding and skilled in using typical functions in solving math and physics problems.
	CO4	Mastering and applying the basic concepts of complex variable calculus
	CO5	Mastering and applying complex variable calculus in solving simple math and physics problems.
	CO6	Understanding and skill in using complex variable calculus to solve math and physics problems.
	CO7	Mastering and applying the basic concepts of complex variable calculus.
	CO8	Mastering and applying the calculus of variations in solving simple math and physics problems.
	CO9	Understand and be skilled in using the calculus of variations in solving math and physics problems.

		Learning Materials	Learning Methods	Time Allocation

The Correlation of CO to Learning Materials and Methods, and Time Allocation	***CO 1, CO 2, CO 3***	Introduction and introduction to the particular function, the Gamma function	TCL-SCL mixed	***3X50 minutes***
	CO 1, CO 2, CO 3	Explanation of the Beta function	TCL-SCL mixed	***3X50 minutes***
	CO 1, CO 2, CO 3	Explanation of the Error function	TCL-SCL mixed	***3X50 minutes***
	CO 1, CO 2, CO 3	Practice questions for typical functions (Gamma, Beta, and Error functions)	TCL-SCL mixed	***3X50 minutes***
	CO 1, CO 2, CO 3	Explanation of Legendre and Bessel functions	TCL-SCL mixed	***3X50 minutes***
	CO 1, CO 2, CO 3	Explanation of Hermite functions	TCL-SCL mixed	***3X50 minutes***
	CO 1, CO 2, CO 3	Practice questions for special functions (Legendre, Bessel, and Hermite Functions	TCL-SCL mixed	***3X50 minutes***
	Midterm exam/Project Task Results/Case Analysis Results			
	CO 4, CO 5, CO 6, CO 7	Introduction and introduction to complex variable functions, analytical functions	TCL-SCL mixed	***3X50 minutes***
	CO 4, CO 5, CO 6, CO 7	Explanation of the Laurent series	TCL-SCL mixed	***3X50 minutes***
	CO 4, CO 5, CO 6, CO 7	Introduction and introduction about residue	TCL-SCL mixed	***3X50 minutes***
	CO 4, CO 5, CO 6, CO 7	Practice questions for complex variable functions (Analytical functions, Laurent series, and Residues)	TCL-SCL mixed	***3X50 minutes***
	CO 8, CO 9	Explanation of the application of residues and 3D Taylor series	TCL-SCL mixed	***3X50 minutes***
	CO 8, CO 9	An explanation of the calculus of variations	TCL-SCL mixed	***3X50 minutes***
	CO 8, CO 9	Practice questions for typical functions of complex variables and calculus of variations	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	**Listening and taking notes on the material. Willing to complete the sample questions on the whiteboard.**			
Access to Learning Media/ LMS and Offline and Online Percentage	Offline (LCD, PPT Slide, Whiteboard, Laptop) and Online (Zoom Meeting, Google Meet, Google Classroom)			

<table>
<tr><td rowspan="8">Assessment Methods and Synchronization with CO</td><td rowspan="2">Assessment Methods</td><td rowspan="2">Assessment Percentage</td><td rowspan="2">Criteria/ Indicators</td><td colspan="9">CO</td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr>
<tr><td>Participatory Activity*</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Project Results/ Case Study Results/ PBL Results*</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="12">Cognitive</td></tr>
<tr><td>Assignment</td><td>40</td><td></td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>Midterm Exam</td><td>30</td><td></td><td>√</td><td>√</td><td>√</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Final Exam</td><td>30</td><td></td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>Total</td><td>100</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="12">*) 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%.</td></tr>
<tr><td>References</td><td colspan="12">Main References;
1. M.L. Boas, Mathematical Methods in The Physical Sciences 2nd ed, John Wiley & Sons, 1983..
2. G.B. Arfken and H.J. Weber, Mathematical Methods for Physicists, Academic Press, 1995..
3. K.F. Rilley, M.P. Hobson, and S.J. Bence, Mathematical Methods for Physics and Engineering, 3rd ed. Cambridge University Press, 2006..</td></tr>
<tr><td>Lecturers (Team Teaching)</td><td colspan="12">1. Muh. Farchani Rosyid</td></tr>
<tr><td rowspan="2">Authorization</td><td>Date of Drafting</td><td colspan="3">Lecturer Coordinator</td><td colspan="2">Head of Curriculum Committee</td><td colspan="6">Head of Study Program</td></tr>
<tr><td></td><td colspan="3">Muh. Farchani Rosyid</td><td colspan="2"></td><td colspan="6">Dr. Eng. Ahmad Kusumaatmaja, S.Si., M.Sc.</td></tr>
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