

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



Physics Undergraduate Study Program
Physics Department
Selected Topic in Computational Physics
MFF 3024/ 2 Credits

Lecturer Coordinator:
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Dr. Eko Sulistya, M.Si.

UNIVERSITAS GADJAH MADA
FACULTY OF MATHEMATICS AND NATURAL SCIENCE
2022



Universitas Gadjah Mada
 Faculty of Mathematics and Natural Science
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Document Number :

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Code	Course Name	Credits (Credits)		Semester	Status	Prerequisite
<i>MFF 3024</i>	<i>Selected Topic in Computational Physics</i>	<i>T: 2</i>	<i>P: ...</i>	<i>EVEN</i>	<i>Elective</i>	<i>Computational Physics (MFF 2027)</i>
Short Description	<p>The Selected Topic in Computational Physics course is an elective course with 2 Credits in the 2021 curriculum for the Bachelor of Physics at Gadjah Mada University, which can be taken in the Even semester. To be able to take this course, students are advised to have completed the Computational Physics course. In the 2021 Curriculum of the Physics Undergraduate Study Program, this course is associated with competencies in the Knowledge Aspect (PLO 2) and the Long Life Learning/Self-Development Aspect (PLO 5).</p>					
Program Learning Outcomes (PLO) Imposed on the Course	<i>PLO 2</i>	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.				
	<i>PLO 5</i>	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:					
	<i>CO1</i>	Know and understand advanced computational methods in solving various current physics problems				
	<i>CO2</i>	Applying advanced computational methods in solving various physics problems				
The Correlation of CO to Learning Materials and Methods, and Time Allocation			Learning Materials		Learning Methods	Time Allocation
	<i>CO 1, CO 2</i>		The basic principles and implementation of high-performance computing with parallel computing strategies or quantum computers		TCL-SCL mixed	<i>2X50 minutes</i>
	<i>CO 1, CO 2</i>		Solving N-body system problems with the Monte-Carlo method		TCL-SCL mixed	<i>2X50 minutes</i>
	<i>CO 1, CO 2</i>		Density Functional Method Theory (DFT)		TCL-SCL mixed	<i>2X50 minutes</i>
	<i>CO 1, CO 2</i>		Density Matrix Renormalization Group (DMRG) Method		TCL-SCL mixed	<i>2X50 minutes</i>
	<i>CO 1, CO 2</i>		The Suzuki-Trotter decomposition method or another approximation method,		TCL-SCL mixed	<i>2X50 minutes</i>

	<i>CO 1, CO 2</i>	Simulation of Random Walk and Traveling Salesman Problem	TCL-SCL mixed	<i>2X50 minutes</i>	
	<i>CO 1, CO 2</i>	Radioactive Decay Simulation	TCL-SCL mixed	<i>2X50 minutes</i>	
Midterm exam/Project Task Results/Case Analysis Results					
	<i>CO 1, CO 2</i>	Solution of Partial Differential Equations	TCL-SCL mixed	<i>6X50 minutes</i>	
	<i>CO 1, CO 2</i>	Fast Fourier Transform and Signal Filtering problems	TCL-SCL mixed	<i>8X50 minutes</i>	
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) and Online (Zoom Meeting, Google Meet, Google Classroom)				
Assessment Methods and Synchronization with CO	Assessment Methods	Assessment Percentage	Criteria/ Indicators	CO1	CO2
	Participatory Activity*				
	Project Results/ Case Study Results/ PBL Results*				
	Cognitive				
	Assignment	10		√	√
	Quiz	10		√	√
	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; <ol style="list-style-type: none"> 1. Robin H. Landau, Manual J. Paez dan Critian C. Bordelanu, 2008, A Survey of Computational Physics, Princeton University Press, New Jersey. 				
Lecturers (Team Teaching)	<ol style="list-style-type: none"> 1. Dr.Eng. Fahrudin Nugroho, S.Si., M.Si. 2. Dr. Eko Sulistya, M.Si. 				

	Date of Drafting	Lecturer Coordinator	Head of Curriculum Committee	Head of Study Program
Authorization		<i>Dr.Eng. Fahrudin Nugroho, S.Si., M.Si.</i>		<i>Dr. Eng. Ahmad Kusumaatmaja, S.Si., M.Sc.</i>