SEMESTER LEARNING ACTIVITY PLANS (SLAP)

SEMESTER ODD 2022/2023

Physics Undergraduate Study Program

Physics Department

Mechanics II

MFF 2402/ 2 Credits

Lecturer Coordinator:

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Dr. Bambang Murdaka Eka Jati, M.S.

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 :** ……

SEMESTER LEARNING ACTIVITY PLANS (SLAP)

Code	Course Name	Credits (Credits)		Semester	Status	Prerequisite
MFF 2402	*Mechanics II*	*T: 2*	*P: …*	*ODD*	*Compulsory*	*Mechanics I (MFF1401)*

Short Description		It is a continuation of Mechanics I, with the primary reference being the book Analytical Mechanics (written by Fowles and Cassidy (2006)). Topics covered pre-UTS: (1) Euler Lagrange Equations, (2) Constraints and Force Constraints, (3) Lagrange Functions and Energy, (4) Calculus of Variations, (5) Hamilton Equations, (6) Phase Spaces, and (7) Lionville Theorem and Recurrence. The discussion on pre-UAS topics: (8) Centered Field Motion: Kepler's Laws and Ellipse Equations, (9) Motion in General and Special Central Forces, (10) Orbital Stability and Particle Scattering, (11) Rigid Body Dynamics and Euler's Equations, (12) Principal Axes and Free Rotation in Rigid Body, (13) Fluid Flow and Heat Flow in Fluids, and (14) Bernoulli's Law of Dynamics. The 14 topics are presented in 14 face-to-face meetings, for 100 minutes per face-to-face.
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	Can solve problems and cases of classical mechanics related to Euler-Lagrange Equation, Calculus of Variations, Hamilton's Principle, and Phase Spaces [PLO 2 and PLO 5]. .
	CO2	Can solve problems and cases of classical mechanics related to Motion in a Centralized Field, Dynamics of Motion of Rigid Bodies about Any Axis, and Fluid Flow Dynamics [PLO 2 and PLO 5].

		Learning Materials	Learning Methods	Time Allocation
The Correlation of CO to Learning Materials and Methods, and Time Allocation	***CO 1***	Euler Lagrange's equations	TCL-SCL mixed	***2X50 minutes***
	CO 1	Constraints and Forces of Constraint	TCL-SCL mixed	***2X50 minutes***
	CO 1	Lagrange Function and Energy	TCL-SCL mixed	***2X50 minutes***
	CO 1	Calculus of Variation	TCL-SCL mixed	***2X50 minutes***
	CO 1	Hamilton's equation	TCL-SCL mixed	***2X50 minutes***
	CO 1	Phase Space	TCL-SCL mixed	***2X50 minutes***
	CO 1	Lionville Theorem and Recurrence	TCL-SCL mixed	***2X50 minutes***
	Midterm exam/Project Task Results/Case Analysis Results			
	CO 2	Centered Field Motion: Kepler's Laws and Ellips Equations	TCL-SCL mixed	***2X50 minutes***

	CO 2	Motion in General and Special Central Forces	TCL-SCL mixed	***2X50 minutes***
	CO 2	Orbit Stability and Particle Scatter	TCL-SCL mixed	***2X50 minutes***
	CO 2	Rigid Body Dynamics and Euler's Equation,	TCL-SCL mixed	***2X50 minutes***
	CO 2	Principal Axis and Free Rotation in Rigid Bodies	TCL-SCL mixed	***2X50 minutes***
	CO 2	Fluid Flow and Heat Flow in Fluids	TCL-SCL mixed	***2X50 minutes***
	CO 2	Bernoulli's Law of Dynamics	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	**Students are actively taught in the classroom and trained to solve Classical Mechanics cases independently or in collaboration with friends.**
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*	**10**		√	
Project Results/ Case Study Results/ PBL Results*	**40**			√
Cognitive				
Assignment	**5**		√	√
Quiz	**5**		√	
Midterm Exam	**20**		√	
Final Exam	**20**			√
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. Fowles, G.R. & Cassidy, G.L., 2006: Analytical Mechanics, 6th edition, Thomson Brooks & Cole.
2. Douglas, G., 2006: Classical Mechanics, 2nd edition, Cambridge University Press, Cambridge.

<table>
<tr><td>Lecturers (Team Teaching)</td><td colspan="4">1. Dr. Muh. Farchani Rosyid, M.Sc.
2. Dr. Bambang Murdaka Eka Jati, M.S.</td></tr>
<tr><td rowspan="2">Authorization</td><td>Date of Drafting</td><td>Lecturer Coordinator</td><td>Head of Curriculum Committee</td><td>Head of Study Program</td></tr>
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