SEMESTER LEARNING ACTIVITY PLANS (SLAP)

SEMESTER EVEN 2022/2023

Physics Undergraduate Study Program

Physics Department

Introduction to Nanoscience

MFF 3680/ 2 Credits

Lecturer Coordinator:

Dr.Eng. Edi Suharyadi, S.Si., M.Eng.
Prof. Dr. Eng. Kuwat Triyana, 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 3680	*Introduction to Nanoscience*	*T: 2*	*P: …*	*EVEN*	*Elective*	*Atomic and Molecular Physics (MFF 2310)*

Short Description	The Introduction to Nanoscience course is a 2 Credits elective course in the 2021 curriculum for the Bachelor of Physics Study Program at Gadjah Mada University, which can be taken in even semesters. To take this course, students are advised to complete the Atomic and Molecular Physics course. In the 2021 Curriculum for the Bachelor of Physics Study Program this course is related to competence in the Aspect of Knowledge (PLO 2).	
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.
Course Outcomes (CO)	**After completing this course, students are expected to be able to:**	
	CO1	Know and understand the concept of nanoscience and technology
	CO2	Knowing and understanding the concept of physics of compressed matter in nanosystems
	CO3	Knowledge and understanding of nanostructures and their characteristics

		Learning Materials	Learning Methods	Time Allocation
The Correlation of CO to Learning Materials and Methods, and Time Allocation	***CO1***	1. Introduction to the concept of nanoscience and nanotechnology 2. The concept of size-dependent (Bulk Material and Film)	TCL-SCL mixed	***6X50 minutes***
	CO2	Summary of the concept of physics of incompressible substances in nanosystems : Meeting of states, electronic structure, phonons, Joint Density of States	TCL-SCL mixed	***4X50 minutes***
	CO3	Study of nanostructures: quantum dot, quantum well and quantum wires	TCL-SCL mixed	***4X50 minutes***
	Midterm exam/Project Task Results/Case Analysis Results			
	CO3	Physics of nanostructures	TCL-SCL mixed	***2X50 minutes***
	CO3	Summary Fabrication of nanostructures: Pulse Laser	TCL-SCL mixed	***6X50 minutes***

		Deposition (PLD), Molecular Beam Epitaxy (MBE), Self-Assembly Material (SAM).		
	CO3	Summary of Nanostructure Characterization: Atomic Force Microscopy (AFM), Scanning Tunneling Microscopy (STM), Spectroscopy Ellipsometry (SE).	TCL-SCL mixed	***6X50 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) and Online (Zoom Meeting, Google Meet, Google Classroom)

Assessment Methods and Synchronization with CO

Assessment Methods	Assessment Percentage	Criteria/ Indicators	CO1	CO2	CO3
Participatory Activity*					
Project Results/ Case Study Results/ PBL Results*					
Cognitive					
Assignment	**10**		√	√	√
Quiz	**0**				
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. Douglas Natelson, Nanostructures and Nanotechnology, Cambridge University Press, 2015. (e-book is available).
2. Vladimir V. Mitin, Dimitry I. Sementsov, Nizami D. Vagidov, Quantum Mechanics of Nanostructures, Cambridge University Press, Cambridge UK, 2010 (e-book is available).

Lecturers

1. Dr.Eng. Edi Suharyadi, S.Si., M.Eng.

(***Team Teaching***)	2. Prof. Dr. Eng. Kuwat Triyana, M.Si.			
Authorization	**Date of Drafting**	**Lecturer Coordinator**	**Head of Curriculum Committee**	**Head of Study Program**
		Dr.Eng. Edi Suharyadi, S.Si., M.Eng.		*Dr. Eng. Ahmad Kusumaatmaja, S.Si., M.Sc.*