SEMESTER LEARNING ACTIVITY PLANS (SLAP)

SEMESTER EVEN 2022/2023

Physics Undergraduate Study Program

Physics Department

Materials Analysis Method

MFF 3812/ 3 Credits

Lecturer Coordinator:

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 :** ……

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Code	Course Name	Credits (Credits)		Semester	Status	Prerequisite
MFF 3812	*Materials Analysis Method*	*T: 3*	*P: …*	*EVEN*	*Elective*	*Solid State Physics I (MFF 2601), Quantum Physics I (MFF 2034)*

Short Description	The learning objectives of this Material Analysis Methods course can be seen from the desired learning outcomes, namely: 1. Provide background knowledge to students about several methods for material characterization. 2. Give students an overview of information obtained when characterizing materials. 3. Explain to students the interaction of electromagnetic waves on materials and their effects. 4. Train students' skills in analysis and problem-solving in order to understand the results shown by the divas or characterization device.	
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	Students can determine the characteristics that must be known about research materials and the research process results.
	CO2	Students can choose the method needed to find out detailed information about the character of a material
	CO3	Students can anticipate the condition of the material whose properties will be known.
	CO4	Students can analyze the results shown by supporting tools

		Learning Materials	Learning Methods	Time Allocation
The Correlation of CO to Learning Materials and Methods, and Time Allocation	***CO1, CO2, CO3, CO4***	Introduction: Basics of Spectroscopy, GEM interaction with matter, Uv-Vis Spectroscopy.	TCL-SCL mixed	***3X50 minutes***
	CO1, CO2, CO3, CO4	UV-Vis spectroscopy, and calculating the Energy Gap from the UV-Vis curve, Assignment review paper using Uv-Vis characterization	TCL-SCL mixed	***3X50 minutes***
	CO1, CO2, CO3, CO4	FT-IR spectroscopy, Raman spectroscopy	TCL-SCL mixed	***3X50 minutes***
	CO1, CO2, CO3, CO4	Atomic Absorption Spectrometry (AAS) and Atomic Fluorescence Spectrometry (AFS) Paper review assignment using FT IR, Raman,	TCL-SCL mixed	***3X50 minutes***

		AAS and AFS (group) characterization		
	CO1, CO2, CO3, CO4	Gas Chromatography (GC), High Performance Liquid Chromatography (HPLC), mass spectroscopy (MS);	TCL-SCL mixed	***3X50 minutes***
	CO1, CO2, CO3, CO4	Nuclear Magnetic Resonance (NMR), Exposure group assignment	TCL-SCL mixed	***3X50 minutes***
	CO1, CO2, CO3, CO4	Thermogravimetric Analysis (TGA), Differential Scanning Calorimetry (DSC)	TCL-SCL mixed	***3X50 minutes***
	Midterm exam/Project Task Results/Case Analysis Results			
	CO1, CO2, CO3, CO4	Optical Microscopy, Confocal Microscopy,	TCL-SCL mixed	***3X50 minutes***
	CO1, CO2, CO3, CO4	Scanning Electron Microscopy or SEM, Transmission Electron Microscopy or TEM,	TCL-SCL mixed	***3X50 minutes***
	CO1, CO2, CO3, CO4	Scanning Probe Microscopy or SPM, Scanning Tunneling Microscopy or STM, Atomic Force Microscopy (AFM),	TCL-SCL mixed	***3X50 minutes***
	CO1, CO2, CO3, CO4	Elctrochemical instruments: Potentiometry, Voltammetry, Conductimetry;	TCL-SCL mixed	***3X50 minutes***
	CO1, CO2, CO3, CO4	X-ray Diffraction (XRD).	TCL-SCL mixed	***3X50 minutes***
	CO1, CO2, CO3, CO4	Electronic Impedans Analyzer	TCL-SCL mixed	***3X50 minutes***
	CO1, CO2, CO3, CO4	Student assignments (group and independent)	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	**Learn to study and study: protein physics, characterization in protein physics, introduction to polymers, application of polymers in material physics.**
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**	**CO4**
	Participatory Activity*						
	Project Results/ Case						

	Study Results/ PBL Results*						
	Cognitive						
	Assignment	**40**		√	√	√	√
	Midterm Exam	**30**		√	√	√	√
	Final Exam	**30**		√	√	√	√
	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. McMohan, G., 2007: Analytical Instrumentation: A Guide to Laboratory, Portable and Miniaturized Instruments, ohn Wiley & Sons Ltd, England. 2. Skoog, D.A. dan West, D.M., 1980: Principles of Instrumental Analysis, Sounders College, Philadelphia.
Lecturers (*Team Teaching*)	1. Chotimah, M.Si., Dr. 2. Edi Suharyadi, S.Si., M. Eng., Dr.Eng

Authorization	**Date of Drafting**	**Lecturer Coordinator**	**Head of Curriculum Committee**	**Head of Study Program**
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