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

Biomaterial Physics

MFF5870 / 2 Credits

Lecturer Coordinator:

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UNIVERSITAS GADJAH MADA
FACULTY OF MATHEMATICS AND NATURAL SCIENCE
2022

Universitas Gadjah Mada
Faculty of Mathematics and Natural Science
Physics Department / Study Program Master Physics
Semester Even 2022/2023

SEMESTER LEARNING ACTIVITY PLANS (SLAP)

Code	Course Name	Credits (credits)	Semester	Status	Prerequisite
MFF5870	*Biomaterial Physics*	*2*	*Even*	*Elective*	*None*

Short Description

Biomaterial Physics course is Elective course 2 credits (Theory) in the 2022 Curriculum Master Physics Study Program, Faculty of Mathematics and Natural Science UGM.

The syllabus of this course is as follows:
The introduction of organic materials with an emphasis on the science of polymers, the structure, processing, properties and use of organic materials, including polymers, biomacromolecules and organic materials with small molecular sizes. Topics covered include Synthesis and processing of polymers, structure and characteristics of polymers, Properties and applications of polymers and advanced organic materials. In particular, it can choose the right way of Synthesis and processing strategy to prepare some polymers in general. Predict the properties of polymers and molecular materials based on knowledge of their structure and morphology. Choosing the suitable polymer for particular application based on the necessary properties.

The courses are held in class for 14 weeks, each week's session last for 2 x 50 minutes. Four weeks of course period is used for Midterm Exam and Final Exam, each held for two weeks as scheduled.

Student evaluation for course assessments is performed summative and formative. The summative evaluation is implemented as written exams, both Midterm and Final Exam, which take a maximum of 120 minutes. The formative evaluation is implemented as individual assignments for each student in the form of completing an assignment individually. Monitoring is carried out by observing student activities during the course, such as attendance, Q&A and discussion about the material presented, and student performance in completing individual assignments.

Program Learning Outcomes (PLO) Imposed on the Course

PLO 3	Mastering further knowledge of classical and modern physics theory, and its relationship with other disciplines, and has mastered an advanced field of physics specialization that allows him to keep up with the latest international research developments.
PLO 4	Mastering various mathematical disciplines related to an advanced field of physics, and able to develop physical models using various mathematical and computational tools with an inter or multidisciplinary approach to solving problems related to an advanced field of physics.
PLO 6	Able to apply knowledge to analyze, synthesize, formulate problems and solve problems comprehensively in one of advanced field of physics, through experimental or theoretical research, then be able to classify and draw conclusions about their findings for the development of science and technology.

Course Outcomes (CO)	**Upon completion of this course, students should be able to:**			
	CO1	Understand Introduction to Materials Physics; Introduction to Biomaterial and Biochemistry Physics; Synthesis of Hydroxyapatite (HA) and Carbonate Hydroxyapatite.		
	CO2	Understand Biomaterial Characterization: SEM-EDS; Biomaterial Characterization: XRD and FTIR; Biocomposite and Scaffold Biomaterial.		
	CO3	Understand Applications of Biomaterials in Tissue Engineering.		
	CO4	Understand the variety of polymer-based biomaterials and their application in the medical field as implants.		
	CO5	Understand the interaction of biomaterials with tissues and how to test biomaterials (biological tests, physics and so on).		
	CO6			
	CO7			
	CO8			
The Correlation of CO to Learning Materials and Methods, and Time Allocation		**Learning Materials**	**Learning Methods**	**Time Allocation**
	CO1	Introduction of Material Physics	Lecture, discussion	2 x 50 minutes
	CO1	Introduction to Physics of Biomaterials and Bioceramics.	Lecture, discussion	2 x 50 minutes
	CO1	Synthesis of Hydroxyapatite (HA) and Hydroxyapatite Carbonate.	Lecture, discussion	2 x 50 minutes
	CO2	Biomaterial Characterization:SEM-EDS	Lecture, discussion	2 x 50 minutes
	CO2	Characterization of Biomaterials: XRD and FTIR.	Lecture, discussion	2 x 50 minutes
	CO2	Biocomposite and Biomaterial Scaffold.	Lecture, discussion	2 x 50 minutes
	CO2	Application of Biomaterials in Tissue Engineering.	Lecture, discussion	2 x 50 minutes
	CO3		Lecture, discussion	2 x 50 minutes
	CO3		Lecture, discussion	2 x 50 minutes
	CO3		Lecture, discussion	2 x 50 minutes
	CO4		Lecture, discussion	2 x 50 minutes
	CO4		Lecture, discussion	2 x 50 minutes
	CO4		Lecture, discussion	2 x 50 minutes
	CO4		Lecture, discussion	2 x 50 minutes
	Final Exam/ Project Task Results/ Case Analysis Results			
Learning Methods	Lecture, discussion			

Student Learning Experience	Learn to analyze and review: Introduction of Material Physics, Introduction to Physics of Biomaterials and Bioceramics., Synthesis of Hydroxyapatite (HA) and Hydroxyapatite Carbonate., Biomaterial Characterization:SEM-EDS, Characterization of Biomaterials: XRD and FTIR., Biocomposite and Biomaterial Scaffold., Application of Biomaterials in Tissue Engineering., , , , , , , .
Access to Learning Media/ LMS and Offline and Online Percentage	Sync (google meet), Asynchronous (google classroom, video)
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	30%		7,5%	7,5%	7,5%	7,5%
Quiz						
Midterm Exam	35%		17,5%	17,5%		
Final Exam	35%				17,5%	17,5%

*) 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. Paul C. Painter & Michael M. Coleman, 2009, Essentials of Polymer Science and Engineering, DEStech Pub Inc. 2. Robert J. Young, Peter A. Lovell, 1991, Introduction to Polymers, Springer US.
Lecturers (*Team Teaching*)	1. Prof. Yusril Yusuf, S.Si., M.Si., M.Eng., D.Eng., Ph.D. 2. Dr.Eng. Ahmad Kusumaatmaja, S.Si., M.Sc. 3. 4.

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