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

Logic and Symbolic Computation in Physics

MFF5010 / 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
MFF5010	*Logic and Symbolic Computation in Physics*	*2*	*Even*	*Elective*	*None*

Short Description	Logic and Symbolic Computation in 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: 1. Numerical computing definition: truncation and rounding error. The notion of symbolic computing in general. The syllogism and its applications in physics. Computation of diagrams and integers in Syllogism solutions. 2. The notion of symbolic computing specifically: processing of mathematical expressions. Symbolic programming languages and examples of their use. Merging symbolic and numerical computations. 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 the notion of numerical computing, truncation errors, and rounding off.		
	CO2	Understand the notion of symbolic computing in general, syllogisms, and their application in physics.		
	CO3	Understand the computation of diagrams and integers in syllogism solutions, the notion of symbolic computing in particular (processing of mathematical expressions).		
	CO4	Understand the notion of symbolic computing (processing of mathematical expressions), symbolic programming languages, and examples of their use.		
	CO5	Understand the merging of symbolic and numeric computing.		
	CO6			
	CO7			
	CO8			
The Correlation of CO to Learning Materials and Methods, and Time Allocation		**Learning Materials**	**Learning Methods**	**Time Allocation**
	CO1	Definition of numeric computing. Become the basis for understanding symbolic computing.	Lecture	2 x 50 minutes
	CO1	Cutting and rounding errors. To compare with symbolic computing.	Lecture	2 x 50 minutes
	CO1	Understanding symbolic computing in general. It is based in contrast to numerical computing.	Lecture	2 x 50 minutes
	CO2	Understanding symbolic computing in general. As a continuation of number (1).	Lecture	2 x 50 minutes
	CO2	The syllogism and its applications in physics. Definition of syllogism.	Lecture	2 x 50 minutes
	CO2	The syllogism and its applications in physics. An example of its application in physics.	Lecture	2 x 50 minutes
	CO2	Computing diagrams and integers in syllogistic solutions. One way to solve the syllogism.	Lecture	2 x 50 minutes
	CO3	Computing diagrams and integers in syllogistic solutions. As a continuation of number (1).	Lecture	2 x 50 minutes
	CO3	Understanding symbolic computing in particular: processing mathematical expressions. Understand the meaning of symbolic computing.	Lecture	2 x 50 minutes
	CO3	Understanding symbolic computing in particular: processing mathematical expressions. Solve syllogism problems with symbolic computation.	Lecture	2 x 50 minutes

	CO4	Symbolic programming languages and examples of their use (1). Examples of the use of symbolic language.	Lecture	2 x 50 minutes
	CO4	Symbolic programming languages and examples of their use. Continuation of number (1).	Lecture	2 x 50 minutes
	CO4	Combination of symbolic and numeric computing. Understand the merging of symbolic and numeric languages.	Lecture	2 x 50 minutes
	CO4	Merger of symbolic and numeric computing. Continuation of number (1).	Lecture	2 x 50 minutes
	Final Exam/ Project Task Results/ Case Analysis Results			
Learning Methods	Lecture			
Student Learning Experience	Learn to analyze and review: Definition of numeric computing. Become the basis for understanding symbolic computing., Cutting and rounding errors. To compare with symbolic computing., Understanding symbolic computing in general. It is based in contrast to numerical computing., Understanding symbolic computing in general. As a continuation of number (1)., The syllogism and its applications in physics. Definition of syllogism., The syllogism and its applications in physics. An example of its application in physics., Computing diagrams and integers in syllogistic solutions. One way to solve the syllogism., Computing diagrams and integers in syllogistic solutions. As a continuation of number (1)., Understanding symbolic computing in particular: processing mathematical expressions. Understand the meaning of symbolic computing., Understanding symbolic computing in particular: processing mathematical expressions. Solve syllogism problems with symbolic computation., Symbolic programming languages and examples of their use (1). Examples of the use of symbolic language., Symbolic programming languages and examples of their use. Continuation of number (1)., Combination of symbolic and numeric computing. Understand the merging of symbolic and numeric languages., Merger of symbolic and numeric computing. Continuation of number (1)..			
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. A G Grozin, 1997, Using REDUCE in High Energy Physics, Cambridge Univ Press. 2. Hermanto, 2015, Logic and Symbolic Computing teaching materials, FMIPA-UGM.						
Lecturers (*Team Teaching*)	1. Dr. Arief Hermanto, Drs., S.U., M.Sc. 2. 3. 4.						

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