SEMESTER LEARNING ACTIVITY PLANS (SLAP)

SEMESTER ODD 2022/2023

Physics Undergraduate Study Program

Physics Department

Introduction to Econophysics

MFF 4893/ 2 Credits

Lecturer Coordinator:

Dr. Dwi Satya Palupi

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 4893	*Introduction to Econophysics*	*T: 2*	*P: …*	*ODD*	*Elective*	*None*

Short Description	The Introductory Econophysics course is an elective course in the Physics study program, Department of Physics, FMIPA UGM. The introductory Econophysics course aims to introduce physics's role in economics. Econophysics is an interdisciplinary branch of science widely applied in economics. This course contains physics concepts applied in economics, the relationship between physics and economics, analogies used in the fields of physics and economics, and applications of physics that have been made to solve problems in economics. Graduates of the physics study program who take this introductory econophysics course, whether they work as educators, researchers, consultants, bureaucrats, or entrepreneurs, are expected to know the application of physics in the realm of economics. For graduates who work as educators, the introductory econophysics course can motivate them so that the concepts of physics are deepened so that they can be applied in other fields. Through the introductory econophysics course, graduates are expected to have broad insights, especially about applied physics. For graduates who work as researchers, the econophysics course is expected to be a motivation to apply physics to research problems in the economic field. In addition, it is hoped that graduates can develop physics concepts to be further applied in the economic realm.	
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	Able to explain the scope of the field of econophysics, mention the basic similarities and differences between physics and economics
	CO2	Able to explain complex systems in physics and economics, mention analogies between physics and economics
	CO3	Able to explain several applications of thermodynamics in economics, analyze wealth distribution, money distribution, and income distribution using statistical physics concepts
	CO4	Able to formulate market price dynamics by applying the concepts of classical mechanics and quantum mechanics
	CO5	Able to analyze the state of a financial market using stochastic processes, statistical physics concepts, and quantum mechanics concepts

The Correlation of CO to Learning Materials and		**Learning Materials**	**Learning Methods**	**Time Allocation**
	CO 1	1. Explanation of the RPKPS, 2. Scope of the field of econophysics: branches of	TCL-SCL mixed	***2X50 minutes***

Methods, and Time Allocation		physics and the similarities of physics with economics related to objects, methods, amount of data, applications, PACS, the definition of econophysics, differences and		
	CO 2	Economics is a complex system of many objects and interactions, microeconomics and macroeconomics in mathematical equations.	TCL-SCL mixed	***2X50 minutes***
	CO 2	Analogies in the fields of physics and economics: system analogies, data patterns, quantities	TCL-SCL mixed	***2X50 minutes***
	CO 3	Applied thermodynamics in economics: applied equations of state for ideal gases and quantities that express the state of the system, applied statistical physics to obtain distributions of wealth, money, income	TCL-SCL mixed	***2X50 minutes***
	CO 3	The dynamics of commodity prices in the market: describing price dynamics with classical mechanics and prices with quantum mechanics.	TCL-SCL mixed	***2X50 minutes***
	CO 4	Financial markets: definition of financial markets, stock price movements, options, and currency exchange rates,	TCL-SCL mixed	***2X50 minutes***
	CO 4	Stochastic processes applied statistical physics in financial markets: entropy, stock, and option price movements,	TCL-SCL mixed	***2X50 minutes***
	Midterm exam/Project Task Results/Case Analysis Results			
	CO 5	application of quantum mechanics in financial markets: stock and option price movements, probability analogy and operator analogy, calculation methods, the Schrodinger equation, and the Black-School model of trajectory.	TCL-SCL mixed	***14X50 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	**Student** **When Synchronous: actively discussing material and cases.** **When Asynchronous/In Standalone/Structured Assignment:**			

<table>
<tr><td></td><td colspan="8">• study in groups
• take quizzes
• material reflection
• examine literature and problems in society.</td></tr>
<tr><td>Access to Learning Media/ LMS and Offline and Online Percentage</td><td colspan="8">Offline (LCD, PPT Slide, Whiteboard, Laptop) and Online (Zoom Meeting, Google Meet, Google Classroom)</td></tr>
<tr><td rowspan="9">Assessment Methods and Synchronization with CO</td><td>Assessment Methods</td><td>Assessment Percentage</td><td>Criteria/ Indicators</td><td>CO1</td><td>CO2</td><td>CO3</td><td>CO4</td><td>CO5</td></tr>
<tr><td>Participatory Activity*</td><td>20</td><td>Presentation</td><td></td><td>√</td><td></td><td>√</td><td></td></tr>
<tr><td>Project Results/ Case Study Results/ PBL Results*</td><td>30</td><td>Problem Analysis</td><td></td><td></td><td></td><td></td><td>√</td></tr>
<tr><td colspan="8">Cognitive</td></tr>
<tr><td>Assignment and Quiz</td><td>20</td><td></td><td>√</td><td></td><td>√</td><td></td><td></td></tr>
<tr><td>Midterm Exam</td><td>15</td><td></td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td>Final Exam</td><td>15</td><td></td><td></td><td></td><td></td><td>√</td><td>√</td></tr>
<tr><td>Total</td><td>100</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="8">*) 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%.</td></tr>
<tr><td>References</td><td colspan="8">Main References;
1. Montegna, RN dan Stanley, E.H., 2000, An Introduction to Econophysics, Correlations and Complexity in Finance, Cambridge University Press, Cambridge, UK ISBN 0 521 62008 2..
2. Michael Schulz, 2003, Statistical Physics and Economic, concepts, tools, and Application, Spinger Verlag New York..

Additional References:
1. Rickles,Dean, 2007, Econophysics for philosophers.,Studies in History and Philosopy of Modern Physics, , 948 -947., doi: 10.1016/jshpsb.2007.01.0003., www.elsevier.com/locate/sh
2. Dragulescu, A dan Yakovenko,VM., 2000, Statistical Mechanic of money, Eur.Phys.J.B.17.723-729</td></tr>
<tr><td>Lecturers (Team Teaching)</td><td colspan="8">1. Dr. Dwi Satya Palupi</td></tr>
<tr><td>Authorization</td><td>Date of Drafting</td><td colspan="3">Lecturer Coordinator</td><td colspan="2">Head of Curriculum Committee</td><td colspan="2">Head of Study Program</td></tr>
</table>

		Dr. Dwi Satya Palupi		*Dr. Eng. Ahmad Kusumaatmaja, S.Si., M.Sc.*