	Universitas Negeri Surabaya Faculty of Mathematics and Natural Sciences Undergraduate Physics Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Stochastic	4520102206		T=2	P=0	ECTS=3.18	6	July 18, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	Prof. Dr. Munasir, S.Si., M.Si.

Learning model	**Project Based Learning**
Program Learning Outcomes (PLO)	**PLO study program that is charged to the course**
	Program Objectives (PO)
	PLO-PO Matrix

	P.O

PO Matrix at the end of each learning stage (Sub-PO)

P.O	Week															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Short Course Description	The stochastics course discusses the concepts of probability: Quality control, noise, binomial analysis, Bernoulli distribution, continuous random variable, z transform of the Bernoulli distribution time discrete, linear system: continuous discrete.
References	**Main :**
	1. Oliver C. Ibe. 2005. Fundamentals of Applied Probability and Random Processes., University of Mssachusetts Lowell, MA.
	Supporters:
Supporting lecturer	Dzulkiflih, S.Si., M.T.

Week-	Final abilities of each learning stage (Sub-PO)	Evaluation		Help Learning, Learning methods, Student Assignments, [Estimated time]		Learning materials [References]	Assessment Weight (%)
		Indicator	Criteria & Form	Offline (*offline*)	Online (*online*)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

1	· Understand the history of development and background of Operational Research. · Understand the purpose and use of Operational Research. Understand the definition and meaning of operational research.	· Explain the history of development and background of Operational Research. · Discuss the goals and uses of Operational Research. Explain the definition and meaning of operational research	**Criteria:** UTS, UAS, Assignments	· Discussion · Problem Solving 2 X 50			0%
2	· Understand the history of development and background of Operational Research. · Understand the purpose and use of Operational Research. Understand the definition and meaning of operational research.	· Explain the history of development and background of Operational Research. · Discuss the goals and uses of Operational Research. Explain the definition and meaning of operational research	**Criteria:** UTS, UAS, Assignments	· Discussion · Problem Solving 2 X 50			0%
3	· Understand the meaning and function of the integer method. · Know the properties and models of integers. · Know the stages of problem solving using branching and limiting algorithms. Understand integer problems with branching and limiting algorithms	· Explain the meaning and function of the integer method. · Discuss the properties and models of integers. · Explain the stages of problem solving using branching and limiting algorithms. Explaining integer problems with branching and limiting algorithms	**Criteria:** Assignments, UTS and UAS	· Discussion · Problem Solving Assignment 2 X 50			0%
4	· Understand the meaning and function of the integer method. · Know the properties and models of integers. · Know the stages of problem solving using branching and limiting algorithms. Understand integer problems with branching and limiting algorithms	· Explain the meaning and function of the integer method. · Discuss the properties and models of integers. · Explain the stages of problem solving using branching and limiting algorithms. Explaining integer problems with branching and limiting algorithms	**Criteria:** Assignments, UTS and UAS	· Discussion · Problem Solving Assignment 2 X 50			0%
5	· Understand the background of dynamic programs. · Understand the basic principles of dynamic programming.	· Explain the background of dynamic programs. · Apply the basic principles of dynamic programming.	**Criteria:** Task	· Discussion · Problem Solving Assignment 2 X 50			0%
6	· Understand the background of dynamic programs. · Understand the basic principles of dynamic programming.	· Explain the background of dynamic programs. · Apply the basic principles of dynamic programming.	**Criteria:** Task	· Discussion · Problem Solving Assignment 2 X 50			0%

7	· Understand the notation and assumptions in game theory. · Understand and be able to explain the meaning of saddle-point. · Able to interpret saddle point results.	· Explain the notation and assumptions in game theory. · Discuss and be able to explain the meaning of saddle-point. · Explain how to interpret saddle point results.	**Criteria:** UAS, UTS participation	· Discussion · Problem Solving Assignment 2 X 50			0%
8	· Understand the notation and assumptions in game theory. · Understand and be able to explain the meaning of saddle-point. · Able to interpret saddle point results.	· Explain the notation and assumptions in game theory. · Discuss and be able to explain the meaning of saddle-point. · Explain how to interpret saddle point results.	**Criteria:** UAS, UTS participation	· Discussion · Problem Solving Assignment 2 X 50			0%
9	· Discuss the stages of decision making using game theory. · Understand and differentiate between and choose solution methods for each type of problem. · Understand and be able to solve problems using graphical methods. · Solve problems using linear programming methods. Calculations using game theory	· Explain the background and meaning of Decision Trees. Discuss the stages of decision making using Decision Trees.	**Criteria:** UAS UTS and ASSIGNMENTS	· Discussion · Problem Solving Assignment 2 X 50			0%
10	· Discuss the stages of decision making using game theory. · Understand and differentiate between and choose solution methods for each type of problem. · Understand and be able to solve problems using graphical methods. · Solve problems using linear programming methods. Calculations using game theory	· Explain the background and meaning of Decision Trees. Discuss the stages of decision making using Decision Trees.	**Criteria:** UAS UTS and ASSIGNMENTS	· Discussion · Problem Solving Assignment 2 X 50			0%

11	• Understand and the purpose of Markov chains. • Know the notation and terminology of Markov chains. • Understand transition probability and stationary probability. • Understand a transition and stationary probability matrix	· Explain the purpose of Markov chains. · Apply Markov chain notation and terminology. · Discuss transition probability and Stationary probability. Describes a transition and stationary probability matrix	**Criteria:** Task	• Calculating Markov processes, including time, state and transition elements. • Understanding the stages of problem solving using Markov chains. • Determining the use of Markov methods for limited and unlimited stages. with limited or unlimited stages. • Calculate the calculation results. 2 X 50			0%
12	• Understand and the purpose of Markov chains. • Know the notation and terminology of Markov chains. • Understand transition probability and stationary probability. • Understand a transition and stationary probability matrix	· Explain the purpose of Markov chains. · Apply Markov chain notation and terminology. · Discuss transition probability and Stationary probability. Describes a transition and stationary probability matrix	**Criteria:** Task	• Calculating Markov processes, including time, state and transition elements. • Understanding the stages of problem solving using Markov chains. • Determining the use of Markov methods for limited and unlimited stages. with limited or unlimited stages. • Calculate the calculation results. 2 X 50			0%
13	· Understand and aim of Markov chains. · Know the notation and terminology of Markov chains. · Understand transition probability and Stationary probability. Understand a transition and stationary probability matrix	· Explain the purpose of Markov chains. · Apply Markov chain notation and terminology. · Discuss transition probability and Stationary probability. Describes a transition and stationary probability matrix	**Criteria:** UAS UTS	· Discussion · Problem Solving Assignment 2 X 50			0%
14	· Understand the meaning and purpose of queuing theory. · Understand the notation and terminology in queuing theory. Explain the concepts of birth and death and steady state.	· Explain the meaning and purpose of queuing theory. · Define and explain the notation and terminology in queuing theory. Explain the concepts of birth and death and steady state.	**Criteria:** UAS and UTS	· Discussion · Problem Solving Assignment 2 X 50			0%

15	· Understand the meaning and purpose of queuing theory. · Understand the notation and terminology in queuing theory. Explain the concepts of birth and death and steady state.	· Explain the meaning and purpose of queuing theory. · Define and explain the notation and terminology in queuing theory. Explain the concepts of birth and death and steady state.	**Criteria:** UAS and UTS	· Discussion · Problem Solving Assignment 2 X 50			0%
16							0%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
		0%

Notes

1. **Learning Outcomes of Study Program Graduates (PLO - Study Program)** are the abilities possessed by each Study Program graduate which are the internalization of attitudes, mastery of knowledge and skills according to the level of their study program obtained through the learning process.
2. **The PLO imposed on courses** are several learning outcomes of study program graduates (CPL-Study Program) which are used for the formation/development of a course consisting of aspects of attitude, general skills, special skills and knowledge.
3. **Program Objectives (PO)** are abilities that are specifically described from the PLO assigned to a course, and are specific to the study material or learning materials for that course.
4. **Subject Sub-PO (Sub-PO)** is a capability that is specifically described from the PO that can be measured or observed and is the final ability that is planned at each learning stage, and is specific to the learning material of the course.
5. **Indicators for assessing** ability in the process and student learning outcomes are specific and measurable statements that identify the ability or performance of student learning outcomes accompanied by evidence.
6. **Assessment Criteria** are benchmarks used as a measure or measure of learning achievement in assessments based on predetermined indicators. Assessment criteria are guidelines for assessors so that assessments are consistent and unbiased. Criteria can be quantitative or qualitative.
7. **Forms of assessment:** test and non-test.
8. **Forms of learning:** Lecture, Response, Tutorial, Seminar or equivalent, Practicum, Studio Practice, Workshop Practice, Field Practice, Research, Community Service and/or other equivalent forms of learning.
9. **Learning Methods:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, and other equivalent methods.
10. **Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
11. **The assessment weight** is the percentage of assessment of each sub-PO achievement whose size is proportional to the level of difficulty of achieving that sub-PO, and the total is 100%.
12. TM=Face to face, PT=Structured assignments, BM=Independent study.