	Universitas Negeri Surabaya Faculty of Engineering, Bachelor of Information Systems Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Modeling and Simulation	5720102031		T=2	P=0	ECTS=3.18	2	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	I Kadek Dwi Nuryana, S.T., M.Kom.

Learning model: Project Based Learning

Program Learning Outcomes (PLO)

PLO study program that is charged to the course

PLO-30	Able to apply the basic principles of algorithms and computer science theory in modeling and designing computer-based systems in such a way as to demonstrate an understanding of the advantages and disadvantages of existing designs.

Program Objectives (PO)

PO - 1	Students are able to formulate (model and simulate) real system problems.
PO - 2	Students understand system concepts, systems approaches, models and system modeling.
PO - 3	Students can formulate a model of the problem being formulated

PLO-PO Matrix

P.O	PLO-30
PO-1	
PO-2	
PO-3	

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
PO-1																
PO-2																
PO-3																

Short Course Description: This course studies the process of solving problems in real systems through developing mathematical models and simulations starting from understanding system concepts, systems approaches, creating formulations, problems, formulating models to solve real systems and formulating steps to find solutions in solving problems.

References

Main :

1. Gordon, Goeffrey. 1989. System Simulation . India : Prentice-Hall. Private Limited.
2. Law, Averill M. 2007. Simulation Modeling and Analysis . New York : McGrawHill International Edition.
3. Simatupang, Togar M. 1995. Pemodelan Sistem . Klaten: Nindita.
4. Sridadi, Bambang. 2009. Pemodelan dan Simulasi Sistem . Yogyakarta : Informatika.

Supporters:

Supporting lecturer: I Kadek Dwi Nuryana, S.T., M.Kom.
Bonda Sisephaputra, M. Kom.
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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	Students can explain the Real System	1. Explain the meaning of the system 2. Explaining System Classification 3. Determine the relationship between input, output and system 4. explains the concept of State (condition) of a system	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Direct Learning Method: Discussion, Presentation and 2 X 50 exercises			0%
2	Students can understand the concept of models	1. Explain the definition of the model 2. Explain the characteristics of a good model 3. Explains the principles of modeling 4. Explains model classification	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Direct Learning Method: Discussion, Presentation and 2 X 50 exercises			0%
3	Students can develop a model	1. Explaining the Stages of Model Development 2. Explaining the Concept of Model Formulation 3. Explaining the Assumption System 4. Explaining the Systems Approach 5. Explaining the Conceptual Model 6. Identifying Variables 7. Explaining Relationships and Functions 8. Formulating Models 9. Verifying Models 10. Analyzing and Model Solutions 11. Validating the Model 12. Implementing the Model	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and 2 X 50 exercises			0%

4	Students can develop a model	1. Explaining the Stages of Model Development 2. Explaining the Concept of Model Formulation 3. Explaining the Assumption System 4. Explaining the Systems Approach 5. Explaining the Conceptual Model 6. Identifying Variables 7. Explaining Relationships and Functions 8. Formulating Models 9. Verifying Models 10. Analyzing and Model Solutions 11. Validating the Model 12. Implementing the Model	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and 2 X 50 exercises			0%
5	Students can create mathematical models	1. Defining a mathematical model 2. Defining Mathematical Axioms 3. Analyzing the Mathematical Modeling Process 4. Study System Problem Case Studies 5. Analyzing System Characteristics	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and 2 X 50 exercises			0%
6	Students can create mathematical models	1. Defining a mathematical model 2. Defining Mathematical Axioms 3. Analyzing the Mathematical Modeling Process 4. Study System Problem Case Studies 5. Analyzing System Characteristics	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and 2 X 50 exercises			0%

7	Students can Formulate Deterministic Models	1. Explaining Mathematical Formulation Classification 2. Explaining Static Formulation 3. Explaining the Formulation of Different Equations 4. Determining the Formulation of Ordinary Differential Equations 5. Determining Differential Difference Equations 6. Determining the Formulation of Partial Differential Equations 7. Determining the Formulation of Partial Differential Equations with two Dependent Variables	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and 2 X 50 exercises			0%
8	Students can Formulate Deterministic Models	1. Explaining Mathematical Formulation Classification 2. Explaining Static Formulation 3. Explaining the Formulation of Different Equations 4. Determining the Formulation of Ordinary Differential Equations 5. Determining Differential Difference Equations 6. Determining the Formulation of Partial Differential Equations 7. Determining the Formulation of Partial Differential Equations with two Dependent Variables	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and 2 X 50 exercises			0%

9	Students can complete the Stochastic Model Formulation	1. Determining Random Variables and Stochastic Processes 2. Explaining the Types of Stochastic Formulation 3. Explaining Static Formulation 4. Formulating Markov 5. Formulating Time Series 6. Formulating the Poission process 7. Formulating the Weiner process 8. Formulating Differential Equations	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and 2 X 50 exercises			0%
10	Students can complete the Stochastic Model Formulation	1. Determining Random Variables and Stochastic Processes 2. Explaining the Types of Stochastic Formulation 3. Explaining Static Formulation 4. Formulating Markov 5. Formulating Time Series 6. Formulating the Poission process 7. Formulating the Weiner process 8. Formulating Differential Equations	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and 2 X 50 exercises			0%
11	Students can determine model parameterization	1. Explain the types of deterministic and stochastic models 2. Estimating Deterministic Model Parameters 3. Deterministic Model case study 4. Estimating Stochastic Model Parameters 5. Stochastic Model case study	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and practicum 2 X 50			0%

12	Students can determine model parameterization	1. Explain the types of deterministic and stochastic models 2. Estimating Deterministic Model Parameters 3. Deterministic Model case study 4. Estimating Stochastic Model Parameters 5. Stochastic Model case study	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and practicum 2 X 50			0%
13	Students can determine model parameterization	1. Explain the types of deterministic and stochastic models 2. Estimating Deterministic Model Parameters 3. Deterministic Model case study 4. Estimating Stochastic Model Parameters 5. Stochastic Model case study	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and practicum 2 X 50			0%
14	Students are able to validate the model	1. Explain the complexity of the model 2. Carrying out testing and proving the correctness of the model 3. Explain the concept of Mathematical Models 4. Explains validation of mathematical models 5. Validating Deterministic Models 6. Validating Stochastic Models	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation, 2 X 50 Assignment Practice			0%
15	Students are able to validate the model	1. Explain the complexity of the model 2. Carrying out testing and proving the correctness of the model 3. Explain the concept of Mathematical Models 4. Explains validation of mathematical models 5. Validating Deterministic Models 6. Validating Stochastic Models	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation, 2 X 50 Assignment Practice			0%

16	Students are able to validate the model	1. Explain the complexity of the model 2. Carrying out testing and proving the correctness of the model 3. Explain the concept of Mathematical Models 4. Explains validation of mathematical models 5. Validating Deterministic Models 6. Validating Stochastic Models	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation, 2 X 50 Assignment Practice			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** abilities in the process and student learning outcomes are specific and measurable statements that identify the abilities 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.