	Universitas Negeri Surabaya Faculty of Engineering, Electrical Engineering Undergraduate Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
SYSTEM SIMULATION	2020103315	Compulsory Study Program Subjects	T=0	P=0	ECTS=0	6	April 10, 2023

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	Unit Three Kartini, S.T., M.T., Ph.D.	Prof. Dr. I Gusti Putu Asto B., M.T.	Dr. Lusia Rakhmawati, S.T., M.T.

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	This course discusses the theory and application of system simulation and has the ability to carry out system simulations with package programs and system simulation analysis
References	**Main :**

1. W.D. Kelton, R.P. Sadowski, D.T. Sturrock. 2003. Simulation with Arena. 3rd Ed, McGraw Hill Higher Education.
2. A.M. Law, W.D. Kelton. 1991. Simulaton, Modeling and Analysis. 2nd Ed McGraw Hill.

	Supporters:
Supporting lecturer	Unit Three Kartini, S.T., M.T., Ph.D.

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	Able to understand the basic meaning of system simulation	1. Explain the basics of simulation models 2. Explain the simulation system	**Criteria:** 1. The assessment criteria are carried out by looking at aspects: 2. Participation: carried out by observing student activities (weight 2) UTS: carried out with assessments during the middle of the semester (weight 2) UAS: carried out every semester to measure all indicators (weight 3) Assignments: carried out on each indicator (weight 3) Value Student End: 3. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. **Form of Assessment** : Participatory Activities	Presentation, discussion and reflection 2 X 50		**Material:** Meeting material 1 **Reader:** *WD Kelton, RP Sadowski, DT Sturrock. 2003. Simulation with Arena. 3rd Ed, McGraw Hill Higher Education.*	0%
2	Students are able to apply random number algorithms	Ability to generate random numbers	**Criteria:** 1. The assessment criteria are carried out by looking at aspects: 2. Participation: carried out by observing student activities (weight 2) UTS: carried out with assessments during the middle of the semester (weight 2) UAS: carried out every semester to measure all indicators (weight 3) Assignments: carried out on each indicator (weight 3) Value Student End: 3. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. **Form of Assessment** : Participatory Activities	Presentations, discussions and assignments 2 X 50		**Material:** Meeting material 2 **Readers:** *AM Law, WD Kelton. 1991. Simulation, Modeling and Analysis. 2nd Ed McGraw Hill.*	0%

3	Students are able to model and simulate discrete systems	Ability to model and simulate discrete systems	**Criteria:** 1. The assessment criteria are carried out by looking at aspects: 2. Participation: carried out by observing student activities (weight 2) UTS: carried out with assessments during the middle of the semester (weight 2) UAS: carried out every semester to measure all indicators (weight 3) Assignments: carried out on each indicator (weight 3) Value Student End: 3. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. **Form of Assessment** : Participatory Activities	Presentations, discussions and assignments 2 X 50		**Material:** Meeting material 2 **Readers:** *WD Kelton, RP Sadowski, DT Sturrock. 2003. Simulation with Arena. 3rd Ed, McGraw Hill Higher Education.*	0%
4	Students are able to model and simulate queuing systems	Ability to design queue simulations	**Criteria:** 1. The assessment criteria are carried out by looking at aspects: 2. Participation: carried out by observing student activities (weight 2) UTS: carried out with assessments during the middle of the semester (weight 2) UAS: carried out every semester to measure all indicators (weight 3) Assignments: carried out on each indicator (weight 3) Value Student End: 3. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. **Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, discussions and assignments 2 X 50		**Material:** Meeting material 4 **Readers:** *WD Kelton, RP Sadowski, DT Sturrock. 2003. Simulation with Arena. 3rd Ed, McGraw Hill Higher Education.*	0%

5	Able to understand the queuing system	Explain the queuing system	**Criteria:** 1. The assessment criteria are carried out by looking at aspects: 2. Participation: carried out by observing student activities (weight 2) UTS: carried out with assessments during the middle of the semester (weight 2) UAS: carried out every semester to measure all indicators (weight 3) Assignments: carried out on each indicator (weight 3) Value Student End: 3. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. **Form of Assessment** : Participatory Activities	Presentations, discussions and assignments 2 X 50		**Material:** Meeting material 5 **Readers:** *WD Kelton, RP Sadowski, DT Sturrock. 2003. Simulation with Arena. 3rd Ed, McGraw Hill Higher Education.*	0%
6	Students are able to model and simulate queuing systems	Ability to design queue simulations	**Criteria:** 1. Assessment criteria: 2. 1. Participation: carried out by observing student activities (weight: 2) 3. 2. UTS: carried out with an assessment during the middle of the semester (weight: 2) 4. 3. UAS: carried out at the end of each meeting (semester) to measure all indicators (weight 3) 5. 4. Task: carried out on each indicator (weight 3) 6. Student Final Grade: 7. Participation score (2) x Assignment score (3) x UTS score (2) x UAS score (3) divided by 10 **Form of Assessment** : Participatory Activities	Lectures/discussions 3 X 50		**Material:** Meeting material 6 **Readers:** *WD Kelton, RP Sadowski, DT Sturrock. 2003. Simulation with Arena. 3rd Ed, McGraw Hill Higher Education.*	0%

7	Students are able to model and simulate queuing systems	Ability to design queue simulations	**Criteria:** 1. Assessment criteria: 2. 1. Participation: carried out by observing student activities (weight: 2) 3. 2. UTS: carried out with an assessment during the middle of the semester (weight: 2) 4. 3. UAS: carried out at the end of each meeting (semester) to measure all indicators (weight 3) 5. 4. Task: carried out on each indicator (weight 3) 6. Student Final Grade: 7. Participation score (2) x Assignment score (3) x UTS score (2) x UAS score (3) divided by 10 **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Lectures/discussions 3 X 50		**Material:** Meeting material 7 **Readers:** *AM Law, WD Kelton. 1991. Simulation, Modeling and Analysis. 2nd Ed McGraw Hill.*	5%
8	Midterm Exam (UTS)	Evaluation Rubric	**Criteria:** 1. The assessment criteria are carried out by looking at aspects: 2. Participation: carried out by observing student activities (weight 2) UTS: carried out with assessments during the middle of the semester (weight 2) UAS: carried out every semester to measure all indicators (weight 3) Assignments: carried out on each indicator (weight 3) Value Student End: 3. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10.	3 X 50 Performance Test		**Material:** Meeting material 1-7 **Readers:** *WD Kelton, RP Sadowski, DT Sturrock. 2003. Simulation with Arena. 3rd Ed, McGraw Hill Higher Education.*	5%

9	Students are able to model and simulate a simulation continuously	Students' ability to design continuous system simulations	**Criteria:** 1. The assessment criteria are carried out by looking at aspects: 2. Participation: carried out by observing student activities (weight 2) UTS: carried out with assessments during the middle of the semester (weight 2) UAS: carried out every semester to measure all indicators (weight 3) Assignments: carried out on each indicator (weight 3) Value Student End: 3. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. **Form of Assessment** : Project Results Assessment / Product Assessment	Power Point Presentation 3 X 50		**Material:** Meeting material 9 **Readers:** *WD Kelton, RP Sadowski, DT Sturrock. 2003. Simulation with Arena. 3rd Ed, McGraw Hill Higher Education.*	5%
10	Students are able to model and simulate a simulation continuously	Students' ability to design continuous system simulations	**Criteria:** 1. The assessment criteria are carried out by looking at aspects: 2. Participation: carried out by observing student activities (weight 2) UTS: carried out with assessments during the middle of the semester (weight 2) UAS: carried out every semester to measure all indicators (weight 3) Assignments: carried out on each indicator (weight 3) Value Student End: 3. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. **Form of Assessment** : Project Results Assessment / Product Assessment	Power Point Presentation 3 X 50		**Material:** Meeting material 10 **Readers:** *WD Kelton, RP Sadowski, DT Sturrock. 2003. Simulation with Arena. 3rd Ed, McGraw Hill Higher Education.*	10%

11	Students are able to model and simulate a simulation continuously	Students' ability to design continuous system simulations	**Criteria:** 1. The assessment criteria are carried out by looking at aspects: 2. Participation: carried out by observing student activities (weight 2) UTS: carried out with assessments during the middle of the semester (weight 2) UAS: carried out every semester to measure all indicators (weight 3) Assignments: carried out on each indicator (weight 3) Value Student End: 3. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Power Point Presentation 3 X 50		**Material:** Meeting material 11 **Readers:** *WD Kelton, RP Sadowski, DT Sturrock. 2003. Simulation with Arena. 3rd Ed, McGraw Hill Higher Education.*	10%
12	Students are able to model and simulate a simulation continuously	Students' ability to design continuous system simulations	**Criteria:** 1. The assessment criteria are carried out by looking at aspects: 2. Participation: carried out by observing student activities (weight 2) UTS: carried out with assessments during the middle of the semester (weight 2) UAS: carried out every semester to measure all indicators (weight 3) Assignments: carried out on each indicator (weight 3) Value Student End: 3. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. **Form of Assessment** : Project Results Assessment / Product Assessment	Power Point Presentation 3 X 50		**Material:** Meeting material 12 **Readers:** *WD Kelton, RP Sadowski, DT Sturrock. 2003. Simulation with Arena. 3rd Ed, McGraw Hill Higher Education.*	10%

13	Students are able to model and simulate ordinary differential equations	Students' ability to simulate ordinary differential equations	**Criteria:** 1. The assessment criteria are carried out by looking at aspects: 2. Participation: carried out by observing student activities (weight 2) UTS: carried out with assessments during the middle of the semester (weight 2) UAS: carried out every semester to measure all indicators (weight 3) Assignments: carried out on each indicator (weight 3) Value Student End: 3. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. **Form of Assessment** : Participatory Activities	Presentation, Power PointDiscussion 3 X 50		**Material:** Meeting material 13 **Readers:** *WD Kelton, RP Sadowski, DT Sturrock. 2003. Simulation with Arena. 3rd Ed, McGraw Hill Higher Education.*	0%
14	Students are able to model and simulate advanced differential equations	Ability to simulate advanced order differential equations	**Criteria:** 1. The assessment criteria are carried out by looking at aspects: 2. Participation: carried out by observing student activities (weight 2) UTS: carried out with assessments during the middle of the semester (weight 2) UAS: carried out every semester to measure all indicators (weight 3) Assignments: carried out on each indicator (weight 3) Value Student End: 3. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. **Form of Assessment** : Participatory Activities	Presentations, LecturesPower Point 3 X 50		**Material:** Meeting material 14 **Readers:** *WD Kelton, RP Sadowski, DT Sturrock. 2003. Simulation with Arena. 3rd Ed, McGraw Hill Higher Education.*	0%

15	Students are able to model and simulate advanced differential equations	Ability to simulate advanced order differential equations	**Criteria:** 1.The assessment criteria are carried out by looking at aspects: 2.Participation: carried out by observing student activities (weight 2) UTS: carried out with assessments during the middle of the semester (weight 2) UAS: carried out every semester to measure all indicators (weight 3) Assignments: carried out on each indicator (weight 3) Value Student End: 3.Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. **Form of Assessment** : Participatory Activities	Presentations, LecturesPower Point 3 X 50		**Material:** Meeting material 15 **Readers:** *WD Kelton, RP Sadowski, DT Sturrock. 2003. Simulation with Arena. 3rd Ed, McGraw Hill Higher Education.*	0%
16	UAS Final Semester Exam	Evaluation Rubric	**Criteria:** 1.The assessment criteria are carried out by looking at aspects: 2.Participation: carried out by observing student activities (weight 2) UTS: carried out with assessments during the middle of the semester (weight 2) UAS: carried out every semester to measure all indicators (weight 3) Assignments: carried out on each indicator (weight 3) Value Student End: 3.Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10.	Written Test 3 X 50			10%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	7.5%
2.	Project Results Assessment / Product Assessment	32.5%
		40%

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.