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

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Optimization Techniques	2010103005		T=3	P=0	ECTS=6.72	1	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	Unit Three Kartini, S.T., M.T., Ph.D.

Learning model	**Case Studies**
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 Optimization Engineering course studies several methods for solving both linear and non-linear optimization problems. This lecture also studies optimal control. This course includes Linear Programming, Integer Programming, Non Linear Programming, and optimal control
References	**Main :**
	1. D. G. Luenberger and Yinyu Ye, "Linear dan Non linear Programming", 3 rd Edition, Springer, New York, 2008Andreas Antoniou, Wu-Sheng Lu, "Practical Optimization: Algorithms and Engineering Applications, Springer, 2007. 2. Andreas Antoniou, Wu-Sheng Lu, Practical optimization: algorithms and engineering applications, Springer, 2007
	Supporters:
Supporting lecturer	Prof. Dr. I Gusti Putu Asto Buditjahjanto, S.T., M.T. Dr. Raden Roro Hapsari Peni Agustin Tjahyaningtijas, 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	Able to explain the meaning of linear/nonlinear optimization and control. Able to differentiate between linear optimization and nonlinear optimization. Able to formulate a linear optimization problem in the form of a linear program. Able to solve linear optimization problems (maximizing and minimizing) uniform constraints using the Simplex method. Able to solve two-variable linear optimization problems using geometric methods.	1. Accurate explanation of optimization and control accompanied by application examples. 2. Accurate explanation of the differences between linear and nonlinear optimization with examples. 3.. Computational accuracy of linear optimization for mixed constraints 4. Accuracy of calculations and analysis in cost minimization applications 5. Accuracy of calculations and analysis in profit maximization applications		Direct learning 3 X 50			0%
2	Able to explain the meaning of linear/nonlinear optimization and control. Able to differentiate between linear optimization and nonlinear optimization. Able to formulate a linear optimization problem in the form of a linear program. Able to solve linear optimization problems (maximizing and minimizing) uniform constraints using the Simplex method. Able to solve two-variable linear optimization problems using geometric methods.	1. Accurate explanation of optimization and control accompanied by application examples. 2. Accurate explanation of the differences between linear and nonlinear optimization with examples. 3.. Computational accuracy of linear optimization for mixed constraints 4. Accuracy of calculations and analysis in cost minimization applications 5. Accuracy of calculations and analysis in profit maximization applications		Direct learning 3 X 50			0%

3	Able to explain the meaning of linear/nonlinear optimization and control. Able to differentiate between linear optimization and nonlinear optimization. Able to formulate a linear optimization problem in the form of a linear program. Able to solve linear optimization problems (maximizing and minimizing) uniform constraints using the Simplex method. Able to solve two-variable linear optimization problems using geometric methods.	1. Accurate explanation of optimization and control accompanied by application examples. 2. Accurate explanation of the differences between linear and nonlinear optimization with examples. 3.. Computational accuracy of linear optimization for mixed constraints 4. Accuracy of calculations and analysis in cost minimization applications 5. Accuracy of calculations and analysis in profit maximization applications		Direct learning 3 X 50			0%
4	Able to create or develop computer code for the Simplex method and implement the computer code to solve linear programming problems. Able to explain optimization problems that can be solved using integer programming. Able to formulate optimization problems in the form of integer programming. Able to solve pure and mixed integer programming problems using the Branch-and method. -Bound. Able to apply the Branch-and-Bound method to solve Knapsack problems, machine-scheduling problems, and TSP problems	1. Accuracy of results obtained from running program code 2. Accuracy of calculations and analysis in solving Knapsack, machine scheduling, and TSP problems using the Branchand-Bound method.		problem based learning 3 X 50			0%

5	Able to create or develop computer code for the Simplex method and implement the computer code to solve linear programming problems. Able to explain optimization problems that can be solved using integer programming. Able to formulate optimization problems in the form of integer programming. Able to solve pure and mixed integer programming problems using the Branch-and method. -Bound. Able to apply the Branch-and-Bound method to solve Knapsack problems, machine-scheduling problems, and TSP problems	1. Accuracy of results obtained from running program code 2. Accuracy of calculations and analysis in solving Knapsack, machine scheduling, and TSP problems using the Branchand-Bound method.		problem based learning 3 X 50			0%
6	Able to create or develop computer code for the Simplex method and implement the computer code to solve linear programming problems. Able to explain optimization problems that can be solved using integer programming. Able to formulate optimization problems in the form of integer programming. Able to solve pure and mixed integer programming problems using the Branch-and method. -Bound. Able to apply the Branch-and-Bound method to solve Knapsack problems, machine-scheduling problems, and TSP problems	1. Accuracy of results obtained from running program code 2. Accuracy of calculations and analysis in solving Knapsack, machine scheduling, and TSP problems using the Branchand-Bound method.		problem based learning 3 X 50			0%

7	Able to create or develop computer code for the Simplex method and implement the computer code to solve linear programming problems. Able to explain optimization problems that can be solved using integer programming. Able to formulate optimization problems in the form of integer programming. Able to solve pure and mixed integer programming problems using the Branch-and method. -Bound. Able to apply the Branch-and-Bound method to solve Knapsack problems, machine-scheduling problems, and TSP problems	1. Accuracy of results obtained from running program code 2. Accuracy of calculations and analysis in solving Knapsack, machine scheduling, and TSP problems using the Branchand-Bound method.		problem based learning 3 X 50			0%
8	Able to explain optimization problems that are classified as nonlinear optimization and can provide examples. Able to solve nonlinear optimization problems using the SQP method. Able to create or develop computer programs to solve nonlinear optimization problems. Able to solve nonlinear optimization using the reduced gradient method.	1. Accuracy of nonlinear optimization explanation and examples. 2. Accuracy of calculation results using a computer program. 3. Accuracy of calculating nonlinear optimization problems using the SQP method. 4.. Accuracy of calculating nonlinear optimization problems using the reduced gradient method		3 X 50			0%

9	Able to explain optimization problems that are classified as nonlinear optimization and can provide examples. Able to solve nonlinear optimization problems using the SQP method. Able to create or develop computer programs to solve nonlinear optimization problems. Able to solve nonlinear optimization using the reduced gradient method.	1.Accuracy of nonlinear optimization explanation and examples. 2.Accuracy of calculation results using a computer program. 3.Accuracy of calculating nonlinear optimization problems using the SQP method. 4.. Accuracy of calculating nonlinear optimization problems using the reduced gradient method		3 X 50			0%
10	Able to explain optimization problems that are classified as nonlinear optimization and can provide examples. Able to solve nonlinear optimization problems using the SQP method. Able to create or develop computer programs to solve nonlinear optimization problems. Able to solve nonlinear optimization using the reduced gradient method.	1.Accuracy of nonlinear optimization explanation and examples. 2.Accuracy of calculation results using a computer program. 3.Accuracy of calculating nonlinear optimization problems using the SQP method. 4.. Accuracy of calculating nonlinear optimization problems using the reduced gradient method		3 X 50			0%

11	Able to explain optimization problems that are classified as nonlinear optimization and can provide examples. Able to solve nonlinear optimization problems using the SQP method. Able to create or develop computer programs to solve nonlinear optimization problems. Able to solve nonlinear optimization using the reduced gradient method.	1.Accuracy of nonlinear optimization explanation and examples. 2.Accuracy of calculation results using a computer program. 3.Accuracy of calculating nonlinear optimization problems using the SQP method. 4.. Accuracy of calculating nonlinear optimization problems using the reduced gradient method		3 X 50			0%
12	Able to explain optimization problems that are classified as nonlinear optimization and can provide examples. Able to solve nonlinear optimization problems using the SQP method. Able to create or develop computer programs to solve nonlinear optimization problems. Able to solve nonlinear optimization using the reduced gradient method.	1.Accuracy of nonlinear optimization explanation and examples. 2.Accuracy of calculation results using a computer program. 3.Accuracy of calculating nonlinear optimization problems using the SQP method. 4.. Accuracy of calculating nonlinear optimization problems using the reduced gradient method		3 X 50			0%

13	Able to solve nonlinear optimization using the Penalty method and Barrier method. Able to explain that control problems are optimization problems and accompanied by examples. Able to create state space equations for control problems. Able to formulate a problem into a control problem.	1.. Accuracy of nonlinear optimization calculations using the Penalty method. 2.Accuracy of nonlinear optimization calculations using the Barrier method 3.Accurate explanation of control problems as optimization problems with examples. 4.Accuracy of formulating control problems into state space equations.		PBL 3 X 50			0%
14	Able to solve nonlinear optimization using the Penalty method and Barrier method. Able to explain that control problems are optimization problems and accompanied by examples. Able to create state space equations for control problems. Able to formulate a problem into a control problem.	1.. Accuracy of nonlinear optimization calculations using the Penalty method. 2.Accuracy of nonlinear optimization calculations using the Barrier method 3.Accurate explanation of control problems as optimization problems with examples. 4.Accuracy of formulating control problems into state space equations.		PBL 3 X 50			0%

15	Able to solve nonlinear optimization using the Penalty method and Barrier method. Able to explain that control problems are optimization problems and accompanied by examples. Able to create state space equations for control problems. Able to formulate a problem into a control problem.	1.. Accuracy of nonlinear optimization calculations using the Penalty method. 2.Accuracy of nonlinear optimization calculations using the Barrier method 3.Accurate explanation of control problems as optimization problems with examples. 4.Accuracy of formulating control problems into state space equations.		PBL 3 X 50			0%
16							0%

Evaluation Percentage Recap: Case Study

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.