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

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Operations Research	4420103115		T=3	P=0	ECTS=4.77	3	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	Prof. Dr. Raden Sulaiman, 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	This course examines the basic principles of modeling in Linear Programs, Simplex method, Big M method, Two Phase, Duality, Transportation, Assignment, Shortest Path Problem, Minimum Spanning Tree, Maximum Flow.
References	**Main :**

1. Taha, H. A. 2017. Operations Research: An Introduction, Global Edition 10th Edition. Pearson.
2. Ravindran, A R. 2008. Operations Research and Management Science. Taylor & Francis Group
3. M. S. Bazaraa, et.al. 2010. Linear Programming and Network Flows Fourth Edition. John Wiley & Sons, New York.
4. Susanta, B. 1996. Program Linier Edisi Pertama . Proyek Pembinaan Tenaga Akademik Dirjen Dikti

Supporters:

Supporting lecturer	Yuliani Puji Astuti, S.Si., M.Si. Affiati Oktaviarina, S.Si., M.Sc.

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 standard form of linear programming and its solution	1. Determining a mathematical model for a linear problem 2. Solving linear problems using graphic methods 3. Determine the standard form of the linear problem model 4. Determine solutions using graphs and probe lines for problems with single solutions, no solutions, and non-single solutions.		Collaborative Learning Approach (Lecture, discussion and question and answer) 6 X 50			0%
2	Understand the standard form of linear programming and its solution	1. Determining a mathematical model for a linear problem 2. Solving linear problems using graphic methods 3. Determine the standard form of the linear problem model 4. Determine solutions using graphs and probe lines for problems with single solutions, no solutions, and non-single solutions.		Collaborative Learning Approach (Lecture, discussion and question and answer) 6 X 50			0%
3	Understand the basics of the simplex method and be able to apply it to linear programming problems	1. Explain Bases, Canonical Forms, and Target Functions. 2. Using the simplex method to solve linear programming problems.		Collaborative Learning Approach (Lecture, discussion and question and answer) 6 X 50			0%
4	Understand the basics of the simplex method and be able to apply it to linear programming problems	1. Explain Bases, Canonical Forms, and Target Functions. 2. Using the simplex method to solve linear programming problems.		Collaborative Learning Approach (Lecture, discussion and question and answer) 6 X 50			0%

5	Understand Big-M and Two Phase methods	1. Determining artificial variables in linear problems. 2. Using Big-M and Two Phase methods to solve linear programming problems 3. Using Big-M and two Phase methods for maximizing cases		Collaborative Learning Approach (Lecture, discussion and question and answer) 3 X 50			0%
6	Understanding Dual Completion of Primal Simplex Forms	1. Changing the Primal Simplex form into Dual form. 2. Solving Dual forms Solving problems related to Poisson processes		Collaborative Learning Approach (Lecture, discussion and question and answer) 3 X 50			0%
7	Understanding Sensitivity Analysis	Determine sensitivity analysis on changes in boundary values and objective function coefficients		Collaborative Learning Approach (Lecture, discussion and question and answer) 3 X 50			0%
8	U.S.S	U.S.S		USS 3X50			0%
9	Understand solutions to transportation problems	1. Creating mathematical models for transportation problems 2. Solving transportation problems using the Lowest Cost Method, Northwest Corner, and Vogel 3. Using the stepping stone and MoDi methods to optimize transportation cost solutions.		Collaborative Learning Approach (Lecture, discussion and question and answer) 6 X 50			0%
10	Understand solutions to transportation problems	1. Creating mathematical models for transportation problems 2. Solving transportation problems using the Lowest Cost Method, Northwest Corner, and Vogel 3. Using the stepping stone and MoDi methods to optimize transportation cost solutions.		Collaborative Learning Approach (Lecture, discussion and question and answer) 6 X 50			0%

11	Understand solutions to Assignment problems	1. Resolving Assignment Problems 2. Resolving shipping problems (Transshipment Problem)		Collaborative Learning Approach (Lecture, discussion and question and answer) 3 X 50			0%
12	Understand special problems in transportation methods	Explains damaged routes, unbalanced cases, slumps, and maximum patterns in transportation problems		Group Discussion 3 X 50			0%
13	Understand special problems in assignment methods	Explains the assignment of maximum patterns and minimum patterns, unbalanced assignments, and cases of deterioration in assignments.		Group Presentation 3 X 50			0%
14	Understand Goal Programming problem solving	Solve multi-objective problems based on equal weight, priority and ranking		Collaborative Learning Approach (Lecture, discussion and question and answer) 6 X 50			0%
15	Understand Goal Programming problem solving	Solve multi-objective problems based on equal weight, priority and ranking		Collaborative Learning Approach (Lecture, discussion and question and answer) 6 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.