	Universitas Negeri Surabaya Faculty of Postgraduate School, Master of Technology and Vocational Education Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Algorithm Design and Analysis	8310102021	Study Program Elective Courses	T=2	P=0	ECTS=4.48	1	May 10, 2023

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	Dr. Lilik Anifah, S.T., M.T.	.....	Dr. Ir. Achmad Imam Agung, M.Pd.

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 lecture discusses the concepts of Algorithms, Top Down, Bottom Up Programming, Data Structure Models, Abstract Data Types, Algorithm Design Methods, Function Growth, Search, Sorting Algorithms and their applications in everyday life.
References	**Main :**
	1. 1. Cormen. 2009. Introduction to Algoritms 3rd edition. Massachusetts Institute of Technology. 2. Rao. Introduction to Design & Analysis of Algorithms - In Simple Way 3. Levitin. 2012. Introduction to The Design and Analysis of Algorithms. 3rd edition. Pearson.
	Supporters:
	1. Jurnal penelitian yang relevan
Supporting lecturer	Dr. Lilik Anifah, S.T., 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	Understanding Algorithms	- Understanding the definition of an algorithm - Explaining the steps for creating an algorithm. Providing an example of an algorithm in a case	**Criteria:** Assessment score 0-100 **Form of Assessment** : Participatory Activities	Discussion, simulation and reflection 2 X 50		**Material:** Basic Algorithms **References:** *1. Cormen. 2009. Introduction to Algorithms 3rd edition. Massachusetts Institute of Technology. 2.Rao. Introduction to Design & Analysis of Algorithms - In a Simple Way 3. Levitin. 2012. Introduction to The Design and Analysis of Algorithms. 3rd edition. Pearson.*	0%
2	Can analyze Top Down and Bottom Up Programming algorithms	- Understanding Top Down Programming - Explaining examples of Top Down Programming - Understanding Bottom Up Programming Explaining examples of Bottom Up	**Criteria:** Assessment score 0-100 **Form of Assessment** : Participatory Activities	Presentation, discussion and reflection 2 X 50		**Material:** Programming Methods **Literature:** *1. Cormen. 2009. Introduction to Algorithms 3rd edition. Massachusetts Institute of Technology. 2.Rao. Introduction to Design & Analysis of Algorithms - In a Simple Way 3. Levitin. 2012. Introduction to The Design and Analysis of Algorithms. 3rd edition. Pearson.*	0%
3	Understanding Data Structure Models and Abstract Data Types	- Know the Graph/Network Model - Can represent Networks - Understand Connect Algorithms - Understand Data Structures	**Criteria:** Assessment score 0-100 **Form of Assessment** : Participatory Activities	Book [2] Handout 2 X 50		**Material:** Data Structure Model and Abstract Data Type **Library:** *1. Cormen. 2009. Introduction to Algorithms 3rd edition. Massachusetts Institute of Technology. 2.Rao. Introduction to Design & Analysis of Algorithms - In a Simple Way 3. Levitin. 2012. Introduction to The Design and Analysis of Algorithms. 3rd edition. Pearson.*	0%
4	Understanding Data Structure Models and Abstract Data Types	- Know the Graph/Network Model - Can represent Networks - Understand Connect Algorithms - Understand Data Structures		Book [2] Handout 2 X 50			0%

5	Can create programming designs using various Algorithm Design Methods	- Understanding Subgoals, Hill Climbing, Work Backward - Understanding Heuristics - Understanding Backtrack - Understanding Recursion Programming	**Form of Assessment** : Participatory Activities	Presentations, group discussions, simulations and reflections 2 X 50		**Material:** Understanding Subgoals, Hill Climbing, Work Backward - Understanding Heuristics - Understanding Backtrack - Understanding Recursion Programming **Literature:** *1. Cormen. 2009. Introduction to Algorithms 3rd edition. Massachusetts Institute of Technology. 2.Rao. Introduction to Design & Analysis of Algorithms - In a Simple Way 3. Levitin. 2012. Introduction to The Design and Analysis of Algorithms. 3rd edition. Pearson.*	5%
6	Can create programming designs using various Algorithm Design Methods	- Understanding Subgoals, Hill Climbing, Work Backward - Understanding Heuristics - Understanding Backtrack - Understanding Recursion Programming	**Criteria:** Assessment score 0-100 **Form of Assessment** : Test	Presentations, group discussions, simulations and reflections 2 X 50		**Material:** - Understanding Subgoals, Hill Climbing, Work Backward - Understanding Heuristics - Understanding Backtrack - Understanding Recursion Programming **Literature:** *1. Cormen. 2009. Introduction to Algorithms 3rd edition. Massachusetts Institute of Technology. 2.Rao. Introduction to Design & Analysis of Algorithms - In a Simple Way 3. Levitin. 2012. Introduction to The Design and Analysis of Algorithms. 3rd edition. Pearson.*	15%
7	Can create programming designs using various Algorithm Design Methods	- Understanding Subgoals, Hill Climbing, Work Backward - Understanding Heuristics - Understanding Backtrack - Understanding Recursion Programming		Presentations, group discussions, simulations and reflections 2 X 50			0%

8	UTS	Able to create a simple project about soeting and present it	**Criteria:** Assessment score 0-100 **Form of Assessment** : Project Results Assessment / Product Assessment	2 X 50 Project Presentation		**Material:** Project presentation **Bibliography:** *1. Cormen. 2009. Introduction to Algorithms 3rd edition. Massachusetts Institute of Technology. 2.Rao. Introduction to Design & Analysis of Algorithms - In a Simple Way 3. Levitin. 2012. Introduction to The Design and Analysis of Algorithms. 3rd edition. Pearson.*	30%
9	1. Understanding MST Search with Prim‘s Algorithm 2. Understanding Kruskal‘s Algorithm 3. Understanding BFS 4. Understanding DFS 5. Understanding A*	1. Able to explain the algorithm and case examples and their solutions MST Search with the Prim Algorithm 2. Able to explain the algorithms and case examples and their solutions Kruskal Algorithm 3. Able to explain the algorithms and case examples and their solutions BFS 4. Able to explain the algorithms and case examples and their solutions Mmahamie DFS 5. Able to explain the algorithm and case examples as well as solving the A* algorithm	**Criteria:** Assessment score 0-100 **Form of Assessment** : Participatory Activities	· Direct Instruction, Discussion, Paper Review, Assignment, 2 X 50 Presentations		**Material:** MST search with Algorithms **Library:** *1. Cormen. 2009. Introduction to Algorithms 3rd edition. Massachusetts Institute of Technology. 2.Rao. Introduction to Design & Analysis of Algorithms - In a Simple Way 3. Levitin. 2012. Introduction to The Design and Analysis of Algorithms. 3rd edition. Pearson.*	0%
10	1. Understanding MST Search with Prim‘s Algorithm 2. Understanding Kruskal‘s Algorithm 3. Understanding BFS 4. Understanding DFS 5. Understanding A*	1. Able to explain the algorithm and case examples and their solutions MST Search with the Prim Algorithm 2. Able to explain the algorithms and case examples and their solutions Kruskal Algorithm 3. Able to explain the algorithms and case examples and their solutions BFS 4. Able to explain the algorithms and case examples and their solutions Mmahamie DFS 5. Able to explain the algorithm and case examples as well as solving the A* algorithm	**Form of Assessment** : Participatory Activities	· Direct Instruction, Discussion, Paper Review, Assignment, 2 X 50 Presentations		**Material:** MST search with Algorithms **Library:** *1. Cormen. 2009. Introduction to Algorithms 3rd edition. Massachusetts Institute of Technology. 2.Rao. Introduction to Design & Analysis of Algorithms - In a Simple Way 3. Levitin. 2012. Introduction to The Design and Analysis of Algorithms. 3rd edition. Pearson.*	0%

11	1. Understanding MST Search with Prim's Algorithm 2. Understanding Kruskal's Algorithm 3. Understanding BFS 4. Understanding DFS 5. Understanding A*	1. Able to explain the algorithm and case examples and their solutions MST Search with the Prim Algorithm 2. Able to explain the algorithms and case examples and their solutions Kruskal Algorithm 3. Able to explain the algorithms and case examples and their solutions BFS 4. Able to explain the algorithms and case examples and their solutions Mmahamie DFS 5. Able to explain the algorithm and case examples as well as solving the A* algorithm		· Direct Instruction, Discussion, Paper Review, Assignment, 2 X 50 Presentations			0%

12	1. Explain Bubble Sort 2. Explain Selection Sort 3. Explain Insertion Sort 4. Explain Heap Sort 5. Explain Shell Sort 6. Explain Quick Sort 7. Explain Merge Sort 8. Explain Radix Sort 9. Explain Tree Sort	1. Students are able to explain the Bubble Sort algorithm and provide examples of cases in the paper and their solutions 2. Students are able to explain the algorithm explaining Selection Sort and provide examples of cases in the paper and their solutions 3. Students are able to explain the algorithm explaining Insertion Sort and provide examples of cases in the paper and their solutions 4. Students are able to explain the algorithm explaining Heap Sort and provide examples of cases in the paper and their solutions 5. Students are able to explain the algorithm explaining Shell Sort and provide examples of cases in the paper and their solutions 6. Students are able to explain the algorithm explaining Quick Sort and provide examples of cases in the paper and the solution 7. Students are able to explain the algorithm explaining Merge Sort and provide examples of cases in the paper and their solutions 8. Students are able to explain the algorithm explaining Radix Sort and provide examples of cases in the paper and their solutions 9. Students are able to explain the algorithm explaining Tree Sort and provide examples of cases in the paper and the solution	**Criteria:** Assessment score 0-100 **Form of Assessment** : Participatory Activities	· Direct Instruction - Discussion · Questions and answers, · Review Paper 2 X 50		**Material:** Searching algorithm **References:** *1. Cormen. 2009. Introduction to Algorithms 3rd edition. Massachusetts Institute of Technology.* *2.Rao. Introduction to Design & Analysis of Algorithms - In a Simple Way* *3. Levitin. 2012. Introduction to The Design and Analysis of Algorithms. 3rd edition. Pearson.*	5%

13	1. Explain Bubble Sort 2. Explain Selection Sort 3. Explain Insertion Sort 4. Explain Heap Sort 5. Explain Shell Sort 6. Explain Quick Sort 7. Explain Merge Sort 8. Explain Radix Sort 9. Explain Tree Sort	1. Students are able to explain the Bubble Sort algorithm and provide examples of cases in the paper and their solutions 2. Students are able to explain the algorithm explaining Selection Sort and provide examples of cases in the paper and their solutions 3. Students are able to explain the algorithm explaining Insertion Sort and provide examples of cases in the paper and their solutions 4. Students are able to explain the algorithm explaining Heap Sort and provide examples of cases in the paper and their solutions 5. Students are able to explain the algorithm explaining Shell Sort and provide examples of cases in the paper and their solutions 6. Students are able to explain the algorithm explaining Quick Sort and provide examples of cases in the paper and the solution 7. Students are able to explain the algorithm explaining Merge Sort and provide examples of cases in the paper and their solutions 8. Students are able to explain the algorithm explaining Radix Sort and provide examples of cases in the paper and their solutions 9. Students are able to explain the algorithm explaining Tree Sort and provide examples of cases in the paper and the solution	**Criteria:** Assessment score 0-100 **Form of Assessment** : Test	· Direct Instruction - Discussion · Questions and answers, · Review Paper 2 X 50		**Material:** Sorting and searching **References:** *1. Cormen. 2009. Introduction to Algorithms 3rd edition. Massachusetts Institute of Technology.* *2.Rao. Introduction to Design & Analysis of Algorithms - In a Simple Way* *3. Levitin. 2012. Introduction to The Design and Analysis of Algorithms. 3rd edition. Pearson.*	15%

14	1. Explain Bubble Sort 2. Explain Selection Sort 3. Explain Insertion Sort 4. Explain Heap Sort 5. Explain Shell Sort 6. Explain Quick Sort 7. Explain Merge Sort 8. Explain Radix Sort 9. Explain Tree Sort	1. Students are able to explain the Bubble Sort algorithm and provide examples of cases in the paper and their solutions 2. Students are able to explain the algorithm explaining Selection Sort and provide examples of cases in the paper and their solutions 3. Students are able to explain the algorithm explaining Insertion Sort and provide examples of cases in the paper and their solutions 4. Students are able to explain the algorithm explaining Heap Sort and provide examples of cases in the paper and their solutions 5. Students are able to explain the algorithm explaining Shell Sort and provide examples of cases in the paper and their solutions 6. Students are able to explain the algorithm explaining Quick Sort and provide examples of cases in the paper and the solution 7. Students are able to explain the algorithm explaining Merge Sort and provide examples of cases in the paper and their solutions 8. Students are able to explain the algorithm explaining Radix Sort and provide examples of cases in the paper and their solutions 9. Students are able to explain the algorithm explaining Tree Sort and provide examples of cases in the paper and the solution		· Direct Instruction - Discussion · Questions and answers, · Review Paper 2 X 50			0%
15	Implement Searching and Sorting algorithms	Students are able to implement Searching and Sorting algorithms		2 X 50 demonstration and presentation			0%

16	Implement Searching and Sorting algorithms	Students are able to implement Searching and Sorting algorithms	**Criteria:** Assessment score 0-100 **Form of Assessment** : Project Results Assessment / Product Assessment	2 X 50 demonstration and presentation		**Material:** Project presentation about searching **References:** *1. Cormen. 2009. Introduction to Algorithms 3rd edition. Massachusetts Institute of Technology. 2.Rao. Introduction to Design & Analysis of Algorithms - In a Simple Way 3. Levitin. 2012. Introduction to The Design and Analysis of Algorithms. 3rd edition. Pearson.*	30%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	10%
2.	Project Results Assessment / Product Assessment	60%
3.	Test	30%
		100%

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.