	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
Data Structures	5720103069		T=2	P=1	ECTS=4.77	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-5	Have faith in God Almighty and be able to show a religious attitude;
PLO-15	Mastering the scientific basics and skills in a particular field of expertise and having initiative and creativity so that he is able to discover, understand, explain, study and formulate ways to solve problems within his area of expertise. Able to demonstrate independent, quality and measurable performance;
PLO-24	Mastering concepts and skills in computer programming languages;
PLO-29	Able to apply knowledge in the fields of computing, computer networks and programming in accordance with scientific disciplines;

Program Objectives (PO)

PO - 1	Students have knowledge of entrepreneurship theory and development
PO - 2	Students can provide a brief overview of the process of using functions &ndash functions in data structures
PO - 3	Students can carry out trials for the process of implementing concepts &ndash data structure concepts.
PO - 4	Students can create programs by utilizing data structure functions

PLO-PO Matrix

P.O	PLO-5	PLO-15	PLO-24	PLO-29
PO-1				
PO-2				
PO-3				
PO-4				

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																
PO-4																

Short Course Description: Advanced programming material such as pointers, structs, etc. Apart from that, there are also several data structures used in programming, both static and dynamic. And also algorithms in the sorting process and search process. Lectures contain theory, where programming assignments will be given.

References

Main :

1. Ekohariadi, Anita Qoiriah. 2007. Pemrograman Dasar Komputer. Unipress.
2. Malik, D.S. 2011. C++ Programming: From Problem Analysis to Program Design, Fifth Edition. Course Technology, Cengage Learning.
3. Malik,D.S. 2010. Data Structures Using C++, Second Edition. Course Technology, Cengage Learning.
4. Shaffer, Clifford A. A. 2011. Practical Introduction to Data Structures and Algorithm Analysis Edition 3 (C++ Version). Prentice Hall International Inc.
5. Yatini B, Indra, Erliansyah Nasution. 2005. Algortima dan Struktur Data dengan C++. Graha Ilmu,
6. Zakaria, Teddy Marcus. Agus Prijono. 2006. Konsep dan Implementasi Struktur Data. Informatika Bandung

Supporters:

Supporting lecturer: Dwi Fatrianto Suyatno, S.Kom., M.Kom.

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 concepts of arrays, pointers and structures	1.Explain the concept of one and two dimensional arrays 2.Explain the concept of pointers 3.Explain the difference between memory allocation in arrays and pointers 4.Explain the concept of structure 5.Create programs with structure and array declarations on structure data types	**Form of Assessment** : Participatory Activities	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and practicum 8 X 50	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and practicum 8 X 50	**Material:** Arrays, pointers and structures **References:** *Ekohariadi, Anita Qoiriah. 2007. Basic Computer Programming. Unipress.*	4%
2	Understand the concept of single linked list	1. Explain the declaration of a Single Linked List 2. Explain how to search in a Linked List 3. Explain the operation of inserting nodes in a single Linked List (at the beginning, at the end, in the middle) 4. Explain the operation of deleting nodes in a single Linked List (at the beginning, at the middle, at the end) 5. Implementing a single linked list in a case	**Form of Assessment** : Participatory Activities	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and 4 X 50 practicum	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and 4 X 50 practicum	**Material:** Single Linked List **Bibliography:** *Ekohariadi, Anita Qoiriah. 2007. Basic Computer Programming. Unipress.*	4%
3	Understand the concept of single linked list	1. Explain the declaration of a Single Linked List 2. Explain how to search in a Linked List 3. Explain the operation of inserting nodes in a single Linked List (at the beginning, at the end, in the middle) 4. Explain the operation of deleting nodes in a single Linked List (at the beginning, at the middle, at the end) 5. Implementing a single linked list in a case	**Form of Assessment** : Participatory Activities	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and 4 X 50 practicum	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and 4 X 50 practicum	**Material:** Single Linked List **Bibliography:** *Ekohariadi, Anita Qoiriah. 2007. Basic Computer Programming. Unipress.*	4%
4	Understand the concept of double linked lists	1. Explain the double Linked List declaration2. Explain how to search in a double Linked List3. Explain the operation of inserting nodes in a double Linked List (at the beginning, at the end, in the middle) 4. Explain the node deletion operation in a double Linked List (at the beginning, in the middle, at the end) 5. Implementing a double linked list in a case	**Form of Assessment** : Participatory Activities	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and practicum 8 X 50	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and practicum 8 X 50	**Material:** Double Linked List **Bibliography:** *Ekohariadi, Anita Qoiriah. 2007. Basic Computer Programming. Unipress.*	4%
5	Understand the concept of double linked lists	1. Explain the double Linked List declaration2. Explain how to search in a double Linked List3. Explain the operation of inserting nodes in a double Linked List (at the beginning, at the end, in the middle) 4. Explain the node deletion operation in a double Linked List (at the beginning, in the middle, at the end) 5. Implementing a double linked list in a case	**Form of Assessment** : Participatory Activities	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and practicum 8 X 50	Approach: Scientific Model: Cooperative Method: Discussion, Presentation and practicum 8 X 50	**Material:** Double Linked List **Bibliography:** *Ekohariadi, Anita Qoiriah. 2007. Basic Computer Programming. Unipress.*	4%
6	Understand the stack concept	1. Represent Stack with array2. Explain Stack Operations (Push, Pop, empty, isfull etc.)3. Representing a Stack with a Single Linked List4. Representing a Stack with a Double Linked List Implementing a stack in several cases	**Form of Assessment** : Participatory Activities	Approach: Scientific Model: Cooperative Method: Discussion, Presentation, Assignment and practicum exercises 4 X 50	Approach: Scientific Model: Cooperative Method: Discussion, Presentation, Assignment and practicum exercises 4 X 50	**Material:** Stack **Library:** *Zakaria, Teddy Marcus. Agus Prijono. 2006. Concepts and Implementation of Data Structures. Bandung Informatics*	4%

7	Understand the concept of queue	1. Represent the queue with an array2. Explain queue operations (enqueue, dequeue, is empty, is full, etc.)3. Representing a queue with a Single Linked List4. Representing a queue with a Double Linked List Implementing a queue in several cases	**Form of Assessment** : Participatory Activities	Approach: Scientific Model: Cooperative Method: Discussion, Presentation, Assignment and practicum exercises 4 X 50	Approach: Scientific Model: Cooperative Method: Discussion, Presentation, Assignment and practicum exercises 4 X 50	**Material:** Queue **Bibliography:** *Zakaria, Teddy Marcus. Agus Prijono. 2006. Concepts and Implementation of Data Structures. Informatics Bandung*	4%
8	UTS		**Form of Assessment** : Project Results Assessment / Product Assessment	UTS 1x1	UTS 1x1	**Material:** UTS **Library:**	25%
9	Understand the concept of recursion functions and their implementation	1. Explain the basic concept of recursion 2. Implementing recursion in some cases	**Form of Assessment** : Participatory Activities	Approach: Scientific Model: Cooperative Method: Discussion, presentation, Presentation/Assignment and practicum 4 X 50	Approach: Scientific Model: Cooperative Method: Discussion, presentation, Presentation/Assignment and practicum 4 X 50	**Material:** Recursion **Bibliography:** *Shaffer, Clifford AA 2011. Practical Introduction to Data Structures and Algorithm Analysis Edition 3 (C Version). Prentice Hall International Inc.*	3%
10	Understand various methods in sequencing and their implementation	. Explaining the Insertion Method2. Explain the Selection Method3. Explaining the Bubble Method4. Explaining Shell Method5. Explaining the Quick6 Method. Explain the Merge Method7. Examples of simple cases that require sorting to solve, create algorithms and flow charts8. Implementing with C language	**Form of Assessment** : Participatory Activities	Approach: Scientific Model: Cooperative Method: Discussion, Presentation/Assignment and practicum 8 X 50	Approach: Scientific Model: Cooperative Method: Discussion, Presentation/Assignment and practicum 8 X 50	**Material:** Understanding various methods of sorting and their implementation. **Reference:** *Yatini B, Indra, Erliansyah Nasution. 2005. Algorithms and Data Structures with C. Science House,*	3%
11	Understand various methods in sequencing and their implementation	. Explaining the Insertion Method2. Explain the Selection Method3. Explaining the Bubble Method4. Explaining Shell Method5. Explaining the Quick6 Method. Explain the Merge Method7. Examples of simple cases that require sorting to solve, create algorithms and flow charts8. Implementing with C language	**Form of Assessment** : Participatory Activities	Approach: Scientific Model: Cooperative Method: Discussion, Presentation/Assignment and practicum 8 X 50	Approach: Scientific Model: Cooperative Method: Discussion, Presentation/Assignment and practicum 8 X 50	**Material:** Understanding various methods of sorting and their implementation. **Reference:** *Yatini B, Indra, Erliansyah Nasution. 2005. Algorithms and Data Structures with C. Science House,*	3%
12	Understand the concept of searching and its implementation	1. Explain searching using the sequential method2. Explaining Search using the binary method3. Comparing the performance of sequential with binary search4. Implement search methods for simple cases that require an understanding of searching to solve them	**Form of Assessment** : Participatory Activities	Approach: Scientific Model: Cooperative Method: Discussion, Presentation/Assignment and 1 X 1 practicum	Approach: Scientific Model: Cooperative Method: Discussion, Presentation/Assignment and 1 X 1 practicum	**Material:** Understanding the concept of searching and its implementation **References:** *Shaffer, Clifford AA 2011. Practical Introduction to Data Structures and Algorithm Analysis Edition 3 (C Version). Prentice Hall International Inc.*	4%
13	Understand the concept of searching and its implementation	1. Explain searching using the sequential method2. Explaining Search using the binary method3. Comparing the performance of sequential with binary search4. Implement search methods for simple cases that require an understanding of searching to solve them		Approach: Scientific Model: Cooperative Method: Discussion, Presentation/Assignment and 1 X 1 practicum	Approach: Scientific Model: Cooperative Method: Discussion, Presentation/Assignment and 1 X 1 practicum	**Material:** Understanding the concept of searching and its implementation **References:** *Shaffer, Clifford AA 2011. Practical Introduction to Data Structures and Algorithm Analysis Edition 3 (C Version). Prentice Hall International Inc.*	4%

14	Students are able to explain the concept of trees	Approach: Scientific Model: Cooperative Method: Discussion, Presentation/Assignment and practicum	**Form of Assessment** : Participatory Activities	Observing- Observing the power point definition of a treeInquiring- Asking questions about the concept of trees through discussion of the results of their observationsGathering Information-Exploring the types of trees and their usesAssociating- Preparing a summary regarding searches in a tree Communicating- Presenting the summary results 3 X 50	Observing- Observing the power point definition of a treeInquiring- Asking questions about the concept of trees through discussion of the results of their observationsGathering Information-Exploring the types of trees and their usesAssociating- Preparing a summary regarding searches in a tree Communicating- Presenting the summary results 3 X 50	**Material:** Tree concept **Literature:**	4%
15	Students are able to apply the tree concept in programming	1. Applying simple tree concepts into programs; 2. Implementing various types of trees into the program; 3. Implement the tree search method into the program.	**Form of Assessment** : Participatory Activities	Approach: Scientific Model: Cooperative Method: Discussion, Presentation/Assignment and practicum 3 X 50	Approach: Scientific Model: Cooperative Method: Discussion, Presentation/Assignment and practicum 3 X 50	**Material:** Application of tree concepts in programming **References:** *Shaffer, Clifford AA 2011. Practical Introduction to Data Structures and Algorithm Analysis Edition 3 (C Version). Prentice Hall International Inc.*	4%
16	UAS		**Form of Assessment** : Project Results Assessment / Product Assessment	UAS 1x1	UAS 1x1	**Material:** UAS **Literature:**	25%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	49%
2.	Project Results Assessment / Product Assessment	50%
		99%

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.