Data Structure

Module name	Data Structure	
Module level	Undergraduate	
Code	IF221113	
Courses (if applicable)	Data Structure	
Semester	3	
Lecturer	Muhammad Muharrom A.H, S.Kom., M.Kom. (PIC) Dr. Eng. Ir. Anggraini Puspita Sari, MT. Fawwaz Ali Akbar, S.Kom, M.Kom.	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 3rd semester	
Type of teaching, contact hours	Lectures, < 60 students	
Teaching Methods	Cooperative learning, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Programming Algorithm	
Courses description	In this course, students learn several structures and related algorithms to organize (store, arrange, order) a data collection in a computer so that it can be used efficiently. Data abstraction is discussed in order to define a particular data structure (linear or nonlinear) with some examples. Lab works with C/C++ programming language are set to implement appropriate data structure in some problem solving.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to abstract data on real problems according to the concept of linear data structures (stack, queue), non-linear (tree, graph) and using C/C++.	PLO3, PLO6
	CO2 Students are able to implement data access on linear static and dynamic data structures, array and linked list, to solve the problems based on order of data entry (LIFO, FIFO) using C/C++	PLO3, PLO6
	CO3 Students are able to explain terminology in graphs, explain and apply topological sort, find the shortest distance and minimum cost spanning tree in a graph..	PLO3, PLO6
	CO4 Students are able to implement hash-tables, to access data based on key-value data mapping using C/C++.	PLO3, PLO6

Content	● Abstract data type: introduction; concepts of storing, arranging and ordering data in linear/non-linear approaches; ● Linear data structure (stack, queue): push-pop functions in a stack; functions in a queue; empty, full, and top functions for checking the contents of a structure; implementations of stack and queue with array, linked-list and STL for problem solving; ● Non-linear data structure - tree: functions for insertion, deletion, and searching nodes in a tree; binary search tree; graph; traversing algorithms in tree and graph; implementations of tree and graph with array, linked-list and STL for problem-solving; ● Sorting algorithms (selection, insertion, bubble, quick, merge) and searching algorithms (binary, hashing) for storing, arranging and ordering data; analysis of algorithms; ● Hash table data structure
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments
Study and examination requirements and forms of examination	The final grade in the module is composed of: • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments: 15% • Written Midterm assessment: 25% • Final oral exam: 30% Students must have a final grade of 55.6% or higher to pass.
Reading List	● T. Edet, C# Data Structures: Designing for Organizing, Storing and Accessing Information (Algorithms and Data Structures). Independently Published, 2024. ● Kanetkar, Yashavant, Data Structures Through C++: Experience Data Structures C++ through animations, 4th Edition. BPB Publications, 2022. ● M. Mahdi, Data Structures in Depth Using C++: A Comprehensive Guide to Data Structure Implementation and Optimization in C++, 1st edition. Apress, 2025. ● B. Stroustrup, Programming: Principles and Practice Using C++, Third Edition. Addison-Wesley, 2024. ● Farrier, John, Data Structures and Algorithms with the C++ STL: a guide for modern C++ practitioners. Packt Publishing, 2024. ISBN: 9781835468555. [Online]. Available: https://portal.igpublish.com/iglibrary/obj/PACKT0007050?searchid=1754984378631nUxP~lnZ5m6CyBPwKvjLH