



TEACHING PLAN

Course Title : Data Structures and Algorithms (*Struktur Data dan Algoritma*)
Course Code : CCS3202 (K3)
Credit : 3(3+0)
Contact Hours : 1 x 2 hours of lecture &
1 x 1 hour of lecture per week
Total Learning Hours : 120
Semester : Semester 1 2025/2026
Prerequisite : CCS3101

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Objectives:

At the end of this course, students are able to:

1. Identify the suitable data structure for problem solving. (C4)
(*mengenal pasti struktur data yang sesuai bagi penyelesaian masalah.*)
2. develop suitable techniques to represent and edit data in computer memories. (P4)
(*membina teknik yang sesuai untuk mewakili dan mengolah data dalam ingatan komputer.*)
3. analysing the algorithms complexity using big-O notation. (CTPS, NS)
(*menganalisis kekompleksan algoritma menggunakan notasi Big-O.*)

Synopsis:

This course covers the concept of storing data in computer memory. Techniques for the storage and manipulation of structured data, as well as algorithm complexity analysis based on Big-O notation for the purpose of determining efficiency are discussed.

(*Kursus ini meliputi konsep penyimpanan data pada ingatan komputer. Teknik menyimpan dan mengolah data secara berstruktur, serta analisis kekompleksan algoritma berdasarkan notasi Big-O dengan tujuan untuk menentukan kecekapan dibincangkan.*)

Course Contents:

Topic	Week
Chapter 1: Introduction <ul style="list-style-type: none">• Abstract Data Types• Abstraction Concepts• Data Structure Concepts• Data Structure Types• Operations on Data Structures	1
Chapter 2: Algorithm Analysis <ul style="list-style-type: none">• Introduction• Algorithm Analysis• Algorithm Complexity• Best, Worst and Average Cases• Asymptotic Analysis• Big-O Notation• Calculating Program Running Time ASSIGNMENT 1	2

Chapter 3: Stacks <ul style="list-style-type: none"> • Introduction • Stack Abstract Data Type 	<ul style="list-style-type: none"> • Stack Array-Based Implementation • Stack Applications QUIZ 1	3
Chapter 4: Queues <ul style="list-style-type: none"> • Introduction • Queue Abstract Data Type • Queue Array-Based Implementation 	<ul style="list-style-type: none"> • Queue Applications • Queue Simulation ASSIGNMENT 2	4
Chapter 5: Recursive <ul style="list-style-type: none"> • Introduction • Recursive Tracking • Recursive Applications 	TEST 1	5
Chapter 6: Linked Lists <ul style="list-style-type: none"> • Introduction • Types of Linked Lists • Lists in Memory • List Abstract Data Type 	<ul style="list-style-type: none"> • Representation of Linked Lists • Pointer-Based Implementation Of Linked Lists • Linked List Applications ASSIGNMENT 3	6,7
Chapter 7: Trees <ul style="list-style-type: none"> • Tree Terminology and Concepts • Tree Abstract Data Type • Tree Representation 	<ul style="list-style-type: none"> • Binary Search Tree (BST) • AVL Tree • B-Tree QUIZ 2	8,9
Chapter 8: Sorting <ul style="list-style-type: none"> • Introduction • Priority Queue Sorting Methods (Selection Sort And Heap Sort) • Insert And Keep Methods (Insertion Sort And Tree Sort) 	<ul style="list-style-type: none"> • Divide And Conquer Methods (Quick Sort And Merge Sort) • Diminishing Increment Sort Method (Shell Sort) QUIZ 3 ASSIGNMENT 4	10,11
Chapter 9: Searching and Hashing <ul style="list-style-type: none"> • Introduction • Binary Search • Hashing 	<ul style="list-style-type: none"> • Hash Method: Modulo-Division • Collisions 	12
Chapter 10: Graphs <ul style="list-style-type: none"> • Graph Terminology and Concepts • Graph Abstract Data Type • Graph Representation 	<ul style="list-style-type: none"> • Shortest Path (Dijkstra Algorithm) • Minimum Spanning Tree (Kruskal Algorithm) 	13, 14

Assessments:

1. Test 1 : 20%
2. Quizzes : 20%
3. Assignments (individual): 20%
4. Final Examination : 40%

Reference Books:

1. Afshine, A. & Shervine, A. (2022). *Super study guide algorithms & data structures*. Afshine AMIDI and Shervine AMIDI.
2. Carrano, F.M. & Henry, T.M. (2018). *Data structures and abstractions with Java* (5th ed.). Pearson Education.
3. Liang, Y.D. (2019). *Introduction to Java programming and data structures, Comprehensive Version* (11th ed.). Pearson Education.
4. Thomas, H.C., Charles, E.L., Ronald, L.R. & Clifford, S. (2022) *Introduction to algorithms* (4th ed.). The MIT Press.
5. Wengrow, J. (2020). *A common-sense guide to data structures and algorithms: Level up your core programming skills*. Pragmatic Bookshelf.