



TEACHING PLAN

Course Title	:	Data Structures and Algorithms (<i>Struktur Data dan Algoritma</i>)
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
Instructor	:	Dr Hazlina Hamdan hazlina@upm.edu.my / C1-19

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

Chapter 3: Stacks	<ul style="list-style-type: none"> • Introduction • Stack Abstract Data Type <p style="text-align: right;">QUIZ 1</p>	3
Chapter 4: Queues	<ul style="list-style-type: none"> • Introduction • Queue Abstract Data Type • Queue Array-Based Implementation <p style="text-align: right;">ASSIGNMENT 2</p>	4
Chapter 5: Recursive	<ul style="list-style-type: none"> • Introduction • Recursive Tracking • Recursive Applications <p style="text-align: right;">TEST 1</p>	5
Chapter 6: Linked Lists	<ul style="list-style-type: none"> • Introduction • Types of Linked Lists • Lists in Memory • List Abstract Data Type <p style="text-align: right;">ASSIGNMENT 3</p>	6,7
Chapter 7: Trees	<ul style="list-style-type: none"> • Tree Terminology and Concepts • Tree Abstract Data Type • Tree Representation <p style="text-align: right;">QUIZ 2</p>	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) <p style="text-align: right;">QUIZ 3 ASSIGNMENT 4</p>	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.