

## COURSE OUTLINE

**Course Code: SCJ 2013 / SCK 2013**  
**Course Name: Data Structures and Algorithms**  
**Total Contact Hours: 42 hours**  
**Course Pre-requisite: None**

### SYNOPSIS

This course provides an introduction to data structure and algorithms, types of data structures and programming principles. Student will learn abstract data type concepts using class and apply ADT concept in the implementation of data structures. Recursive function, algorithm efficiency, order of magnitude analysis and Big O notation will be discussed. Students will implement operations that can be applied to data structures using various sorting and searching techniques. Further, students will be exposed to linear data structures such as linked lists, stack and queue. Non-linear data structures such as tree and graphs will also be discussed. At the end of the course, students should be able to implement and apply the theory and concepts of data structure in the mini project which is conducted in group.

### LEARNING OUTCOMES

By the end of the course, students should be able to:

No.	Course Learning Outcome	Programme Learning Outcome(s) Addressed	Assessment Methods
1.	Describe all types of data structures and know how to apply them effectively in problem solving.	PO1 (C1, C2, A1, A2, CS2)	LE, Q, T, F
2.	Analyze and select the most suitable and effective algorithm for solving certain problem and case study.	PO2 (C4, A2, CTPS1 )	LE, Q, A, T, PR, F
3.	Develop a medium to complex program as a group mini project by applying data structure concept and present the output in the class.	PO2, PO4,PO5 (C4, CTPS2, A1, A2).	PR, A, Pr, Peer
.	(T – Test ; Q – Quiz; LE – Lab Exercise ; Sbt – Skill-Based Test ; A – Assignment; F – Final Exam)		

### STUDENT LEARNING TIME

Teaching and Learning Activities			Student Learning Time (hours)
Face to face Learning	• Lecturer Centered	Lecture	28
		- Practical/Lab/Tutorial	28
	• Student Centered	- Student Centered Activity	0
	• Others		0
<b>Sub Total</b>			<b>56</b>

Self Learning	Non Face to face or Student Centered Learning (SCL)	10	36
	• Revision	14	
	• Assessment Preparation	12	
	• Others	0	
<b>Sub Total</b>			
Formal Assessment	• Continuous Assessment	25	28
	• Final Examination	3	
	• Others	0	
	<b>Sub Total</b>		
<b>TOTAL SLT</b>			<b>120</b>

### TEACHING METHODOLOGY

E-learning, Lecture and Discussion, Lab Activities, Co-operative Learning, Mini Project, Presentation, Independent Study

### WEEKLY SCHEDULE

Week	Topic	Activities/hours
<b>Week 1</b>	<b>1.0 Introduction to Data Structure &amp; Algorithm</b> 1.1 Types of Data Structure 1.2 Algorithm 1.3 Programming Principle 1.4 ADT and class	Lecture : 2 hours Lab Activity : 2 hours  Assessment: Nil
<b>Week 2</b>	<b>2.0 ADT and Class</b> <b>3.0 C++ revision</b>	Lecture : 2 hours Lab Activity : 2 hours Assessment: <b>LE1</b>
<b>Week 3</b>	<b>4.0 Recursive</b> <b>5.0 Algorithm Efficiency</b> 5.1 Analisa Order of magnitude 5.2 Big O notation	Lecture : 2 hours Lab Activity : 2 hours Assessment: <b>Quiz 1</b>
<b>Week 4-5</b>	<b>6.0 Sorting</b> 6.1 Selection Sort 6.2 Insertion Sort 6.3 Bubble Sort 6.4 Advanced Sorting - Quick Sort 6.5 Merge Sort	Lecture : 4 hours Lab Activity : 2 hours Student Centred learning : 2 hours Assessment: <b>Quiz 2 &amp; LE2</b>
<b>Week 6</b>	<b>7.0 Searching</b> 7.1 Sequential Search 7.2 Binary Search	Lecture : 2 hours Lab Activity : 1 hour Student Centred learning : 1 hour Assessment: <b>Assignment 1</b>
<b>Week 7</b>	<b>8.0 Linked Lists</b> 6.1 Pointer 6.2 Introduction To List 6.3 List Operations 6.4 Types of Link Lists	Lecture : 2 hours Lab Activity : 2 hours Assessment: <b>Test 1</b>

<b>Week 8</b>	6.5 Link List Operation 6.6 Create Link List, Link List Declaration 6.7 Add node, Delete Node 6.8 Find Node, Print Node	Lecture : 2 hours Lab Activity : 2 hours Student Centred learning : 1 hour Assessment: <b>Assignment 2</b>
<b>Week 9</b>	<b>9.0 Stack</b> 7.1 Introduction To Stack 7.2 Stack Operation – pop and push 7.3 Stack Implementation 7.4 stack application	Lecture : 2 hours Lab Activity : 2 hours Assessment: <b>LE3</b>
<b>Week 10-11</b>	<b>8.0 Queue</b> 8.1 introduction 8.2 Queue Implementation (Array and link list) 8.3 Circular queue	Lecture : 4 hours Lab Activity : 4 hours Student Centred learning : 2 hours Assessment: <b>Project &amp; Quiz 3</b>
<b>Week 12-13</b>	<b>9.0 Tree</b> 9.1 Introduction, Terms related to tree 9.2 Binary search tree 9.3 Tree Operation – create node, add node, 9.4 delete node, print node, search node 9.5 Tree Traversal	Lecture : 4 hours Lab Activity : 4 hours Assessment: <b>LE4</b>
<b>Week 14</b>	<b>Project Presentation</b>	Assessment: Project Submission and presentation
<b>Week 15</b>	<b>STUDY WEEK</b>	
<b>Week 16</b>	<b>EXAMINATION WEEK</b>	Assessment: <b>Final Exam</b>

## REFERENCES

1. Nor Bahiah, Dayang Norhayati, Zalmyiah dan Aida. Teaching Modules: Data Structure & Algorithms using C++, Universiti Teknologi Malaysia, 2010.
2. Frank M Carano, Janet J Prichard, “Data Abstraction and Problem Solving with C++”, Walls and Mirrors, Fifth Edition, (2007), Addison Wesley
3. Richard F. Gilberg and Behrouz A. Forouzan, “*Data Structures A Pseudocode Approach With C++*”, Brooks/Cole Thomson Learning, 2001.
4. Nor Bahiah Ahmad et al, “*Struktur Data & Algoritma Menggunakan C++*”, UTM Press, 2005.

## GRADING

No.	Assessment	Number	% each	% total
1	Assignments	2	5%	10
2	Quizzes	2	5%	10
3	Lab Exercises	4	2.5%	10
4	Project	1	10%	10
5	Test 1	1	20%	20
6	Final Exam	1	40%	40
	<b>Overall Total</b>			<b>100</b>