SAMPLE COURSE

Course Information

Course Code	:	CSE 155				Credit	:	3.0
Title	:	Data Structures				Prerequisite	:	None
Type	:	Theory				Contact Hours	:	42
Total Lectures	:	26	No. of Class Test	:	03	Final Examination	:	01
Faculty	:	Mohammad Ashraful Islam						

Rationale

This course aims at facilitating the students to understand the various data structures, their organization and operations in order to characterize their performance, space requirements, scalability etc. for solving a computer problem in an efficient way. The course helps the students to distinguish between different data structures and algorithmic technique and identify suitable algorithms with appropriate data structures for a specified computer program.

Course Objectives

Via appropriate lectures, classroom experiences, assignments, discussions and groupwork etc. this course aims to enable students-

- To **describe** data structures like ADT, stack, queue, linked lists, tree, graph, sorting and searching technique.
- To **explain** how the choice of data structures design methods impacts the performance of programs.
- To **demonstrate** insert, select, update, sort, merge etc basic data structure operations for given data structure in a particular scenario.
- To **examine** the applicability of different data structures like linked lists, stack, queue, trees, graphs to solve computational problems.
- To **evaluate** and **compare** different data structure design method and its associated operations in solving real time computer applications.

Course Outcomes

CO	Descriptions	Knowledge Level (Cognitive domain)
CO155.1	**Identify** the basic data structures, storage structures, its operations, functionalities and applications.	Remember
CO155.2	**Describe** arrays, linked lists, trees, graphs and others linear and non-linear data structures as well as its applications.	Understand
CO155.3	**Apply** various searching and sorting algorithms on linear and non-linear data structures.	Apply
CO155.4	**Examine** different data structures in different scenarios and **compare** their performance in terms of time and memory.	Analyze

CO155.5	Choose and **criticize** appropriate data structure to achieve optimal performance.	Evaluate

CO-PO Correlation Level Matrix

1st Year 2nd Semester — Course Code: CSE 155 — Course Title: Data Structures

#	Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO155.1	Identify the basic data structures, storage structures, its operations, functionalities and applications.	2	1										
CO155.2	Describe arrays, linked lists, trees, graphs and others linear and non-linear data structures as well as its applications.	2	1	1									
CO155.3	Apply various searching and sorting algorithms on linear and non-linear data structures.	2	2	1									
CO155.4	Examine different data structures in different scenarios and compare their performance in terms of time and memory.	2	2	2	1					1	1		
CO155.5	Choose and criticize appropriate data structure to achieve optimal performance.	1	2	2	2					1	1	1	2
	CO155	1.8	1.6	1.5	1.5					1	1	1	2

Level of Correlation: 3-High, 2-Medium, 1-Low

Intended Learning Outcome of the Course

Knowledge

a1.	Will be able to **identify** efficient data structure.
a2.	Will be able to **explain** time and storage complexity of different data structures.
a3.	Will be able to **demonstrate** different data structures and its applications.
a4.	Will be able to **point out** the advantages and limitations of one data structure over another.
a5.	Will be able to **compare** the performance of different sorting and searching algorithms.
a6.	Will be able to **design** solutions using trees and graphs.

Skills

b1.	Will be able to **distinguish** between different data structures.
b2.	Will be able to **choose** efficient data structures and algorithms and use them.
b3.	Will be able to **compare** data structures as fundamental tools of program design.
b4.	Will be able to **perform** classifications (data, results, methods, techniques, algorithms, etc.)
b5.	Will be able to **criticize** one data structure over another for a particular scenario.
b6.	Will be able to **formulate** solutions different algorithms, methods, techniques, etc to solve real life problem.

Attitude

c1.	Will be able to **accept** one of the most fundament concept of computer science and engineering.
c2.	Will develop attitude to **communicate** effectively by oral, written and visual means.
c3.	Will develop attitude to work **effectively** as an individual and as a member of a team.
c4.	Will create positive attitude to **lead** and **motivate** individuals.
c5.	Will build attitude to **tackle** challenges related to data structures.
c6.	Will create positive attitude to **listen** ideas of classmates.

Course Content Outline

CSE155	Data Structures

Teaching and Learning Activities

#	Topic	CO	ILO	Guided Learning — F2F — L	E	P	O	Non-F2F (NF2F)	Independent Learning (NF2F)	Total SLT
1	**Introduction and String Processing** 1.1 Basic terminology 1.2 Mathematical notation and functions, Complexity of algorithms. 1.3 Storing techniques, Operations, word processing, 1.4 Pattern matching algorithm	CO155.1 CO155.2 CO155.3	a1, a2 b2 c1, c3, c4	2	2				4	8
2	**Arrays, Records and Pointers** 2.1 Pointers, Structures, dynamic memory allocations. 2.2 Abstract Data Type, Sorting and Searching Algorithms	CO155.1 CO155.2 CO155.4	a1, a2, a4, a5 b1, b2, b5 c1, c3, c4	3	3				6	12
3	**Linked Lists** 3.1 Memory representation, Implementation and its application	CO155.1 CO155.2 CO155.5	a1, a4 b2, b3 c1, c3, c4	2	2				4	8
4	**Stack, Queue and Recursion** 4.1 Stack Implementation and its Application 4.2 Queue Implementation and its Application 4.3 Iterative Solution and Recursive Solution design	CO155.2 CO155.4 CO155.5	a2, a4 b2, b4, b5 c2, c3, c4, c5, c7	3	3				6	12
5	**Tree-01** 5.1 Basic Tree Concepts 5.2 Tree Traversals 5.3 Binary Trees and their applications 5.4 Binary Search Tree: Insert, Delete, Search and Traversal Algorithms	CO155.1 CO155.3 CO155.4 CO155.5	a1, a2, a3, a6 b1, b2, b3 c1, c3, c4, c7	3	3				6	12
6	**Tree-02** 6.1 Basic Tree Concepts 6.2 AVL Tree 6.3 B trees	CO155.2 CO155.3 CO155.4 CO155.5	a1, a2, a3, a5, a6 b2, b3, b4, b5 c2, c3, c4, c5, c6, c7	3	3				6	12

6.4 Binary Heap and Priority queue						
6.5 Spanning Tree, MST						
6.6 General trees						
Graphs						
7.1 Terminology						
7.2 Graph representation						
7 7.3 Graph traversal techniques	CO155.1	a1, a2, a3, a5, a6				
7.4 Shortest Path Problem	CO155.5	b2, b3, b4, b5	5	5	10	20
7.5 Hashing Methods,		c1, c2, c3, c4, c6, c7				
7.6 Hashed Search						
Total			21	21	42	84

Assessment	Percentage	F2F	Non F2F	STL
Attendance	10%	-	-	-
Tutorial and Assignment	30%	3	15	18
Final Exam	60%	3	15	18
			Total SLT	120

L = Lecture, E = Exercise, P = Practical, O = Others, F2F = Face to Face, Non F2F = Non-Face to Face

#	References/Books Book Name	Author(s)	Ed.	Publishers	Year
1.	Data Structure	Edward M. Reingold	1st	DA Information Services	1983
2.	Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzle	Narasimha Karumanchi	5th	CareerMonk Publications	2016
3.	Data Structures	Seymour Lipschutz	1st	McGraw Hill	2014
4.	Data Structures and Algorithms in C++	Adam Drozdek	5th	Cengage Learning	2012
5.	Data Structure Fundamentals	Md. Rafiqul Islam, M. A. Mottalib	2nd	Research, Extension, Advisory Services and Publications (REASP)	2011

Teaching Materials: Lecture Notes*, Lab Exercises/Notes*, Reference Book, and Computer &Software.

Teaching-Learning Method: Lecture Notes*, PDF Documents, Lab Exercises*, Assignments. *Lecture and Lab Notes that are required for the course will be delivered during class.