University of Asia Pacific (UAP)
Department of Computer Science and Engineering (CSE)

Course Outline

Program:	Computer Science and Engineering (CSE)
Course Title:	Data Structures
Course Code:	CSE 205
Semester:	Spring 2021
Level:	2nd Year 1st Semester
Credit Hour:	3.0
Name & Designation of Teacher:	A S Zaforullah Momtaz, Assistant Professor
Office/Room:	702, 7th Floor, teacher's compound
Class Hours:	Sunday 09:30AM ~ 10:45AM, Tuesday 03:30PM ~ 04:45PM
Consultation Hours:	Monday 03:30PM ~ 04:50PM
E-mail:	zaforullah@uap-bd.edu
Contact:	01723722788
Rationale:	It's a required and prerequisite course to CSE 207 Algorithms, CSE 313 Numerical Methods. The knowledge of Data Structure is very important for the field of Computer Programming In addition to that, in software development concepts of different data structures are thoroughly used.
Pre-requisite	CSE 101, CSE 103, CSE 105
Course Synopsis:	Introduction to data structures and its purposes along with operations and complexity, representation of multidimensional dataset and various types of data operations like insertion, deletion, sorting, searching, compression etc.

Course Objectives (CO): The objectives of this course are:

- Develop algorithms for manipulating stacks, queues, linked lists, trees, and graphs.
- Develop the data structures for implementing the above algorithms.
- Demonstrate a thorough understanding of searching and sorting algorithms including recursive techniques.
- Familiarize the student with the issues of Time complexity and examine various algorithms from this perspective.

Course Outcomes (CO) and their mapping with Program outcomes (PO) and Teaching-Learning Assessment methods:

CO No.	CO Statements: Upon successful completion of the course, students should be able to:	Corresponding POs (Appendix-1)	Bloom's taxonomy domain/level (Appendix-2)	Delivery methods and activities	Assessment Tools
CO1	**Describe** the objective of Discrete Mathematics.	1	1	Lecture, multimedia,	Quiz, Written exam
CO2	**Explain** terms related to the relationship of different variables.	1	1	Lecture, Group discussion	Assignment
CO3	**Understand** various types of computer theories.	4	2	Lecture, Problem Solving, Group discussion	Quiz, Written exam, Assignment
CO4	**Implement** by learning various operations on multidimensional data systems	1,2	Evaluate	Lecture, Problem Solving, Group discussion	Quiz, Written exam, Assignment

Weighting COs with Assessment methods:

Assessment Type	% weight	CO1	CO2	CO3	CO4
Final Exam	**50%**	10	10	15	15
Mid Term	**20%**	5	5	10	
Class performance, Quizzes, Presentation, case study, exam, Assignment, Project, Others.	**30%**	5	10	15	
Total	**100%**	20	25	40	15

Course Content Outline and mapping with COs

Weeks	Topics / Content	Course Outcome	Delivery methods and activities	Reading Materials
1-2	**Introductory concepts**, Data Structures Basic, Array: Memory representation, Basic algorithm on array: insert, delete, and search. Algorithm, complexity, best, worst, average case, Big O notation.	CO1	Lecture, Problem Solving	Data Structures with C, Slides, Class Notes
3-4	**Searching and Sorting Algorithms**: Linear Search, Binary Search, Bubble Sort, Insertion Sort, Merge Sort, Quick Sort, Radix Sort	CO2	Lecture, Problem Solving	Data Structures with C, Slides, Class Notes
5-7	**Linked Lists:** Dynamic memory allocation, Introduction to linked list, Representation of linked list in memory, primitive operations on linked list, searching a linked list, circular linked list, doubly linked list,	CO3	Lecture, Problem Solving	Data Structures with C, Slides, Class Notes
8-9	**Stacks & Queues**: Stacks: Definition, Stack representation, Primitive operations on stack, array representation of stacks Queues: Definition, Queue representation, Primitive operations on queue, array representation of queues, Circular queue, Priority queue, Double ended queue, Applications of queues	CO3	Lecture, Problem Solving	Data Structures with C, Slides, Class Notes
10-11	**Trees-I:** Introduction, Binary tree –strictly binary tree, complete binary tree, representing binary tree in memory, traversing a binary tree, binary Search tree, insertion and deletion in binary search tree, threaded binary tree. Expression trees, construction of an expression tree from prefix and postfix, Heap tree, creation of heap tree, insertion in heap, Deletion from heap	CO4	Lecture, Problem Solving	Data Structures with C, Slides, Class Notes
12-14	**Trees-II & Graphs:** AVL Trees, Rotations in AVL tree, Insertion and deletion in an AVL tree, Huffman's algorithm. Introduction to Graph, Graph theory terminologies, sequential representation of a graph, adjacency matrix and path matrix, Warshall' s algorithm, Linked representation of a graph, Operations on a graph, Traversing a graph, Topological sorting	CO4	Lecture, Problem Solving	Data Structures with C, Slides, Class Notes

Required References:

1. Data Structures with C, SEYMOUR LIPSCHUTZ, Special Indian Edition, Thirteenth reprint 2015, McGraw Hill Education
2. Data Structures using C, Aaron M. Tanenbaum, YedidySeymour Lipschutz, Discrete Mathematics, Last Edition, 2020, Schaum's outline Series.

Recommended References: Data Structures – A Pseudocode Approach with, Richard F Gilberg and Behrouz A Forouzan, Second edition, Fifth Indian Reprint 2015, Cengage Learning

Special Instructions: Students must come to the class prepared for the course material covered in the previous classes. They must submit their assignments on time. No late or partial assignments will be acceptable. There will be no make-up quizzes.

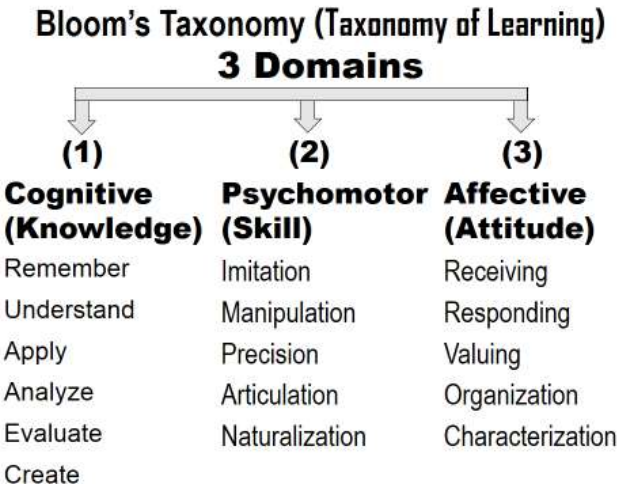
Prepared by	Checked by	Approved by
Course Teacher	Chairman, PSAC committee	Head of the Department

Appendix-1:

Washington Accord Program Outcomes (PO) for engineering programs:

No.	PO	Differentiating Characteristic
1	Engineering Knowledge	Breadth and depth of education and type of knowledge, both theoretical and practical
2	Problem Analysis	Complexity of analysis
3	Design/ development of solutions	Breadth and uniqueness of engineering problems i.e. the extent to which problems are original and to which solutions have previously been identified or codified
4	Investigation	Breadth and depth of investigation and experimentation
5	Modern Tool Usage	Level of understanding of the appropriateness of the tool
6	The Engineer and Society	Level of knowledge and responsibility
7	Environment and Sustainability	Type of solutions.
8	Ethics	Understanding and level of practice
9	Individual and Team work	Role in and diversity of team
10	Communication	Level of communication according to type of activities performed
11	Project Management and Finance	Level of management required for differing types of activity
12	Lifelong learning	Preparation for and depth of Continuing learning.

Appendix-2



Appendix-3: Grading Policy

Numeric Grade	Letter Grade	Grade Point
80% and above	A+	4.00
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.50
65% to less than 70%	B+	3.25
60% to less than 65%	B	3.00
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.50
45% to less than 50%	C	2.25
40% to less than 45%	D	2.00
Less than 40%	F	0.00