Department of Computer

College of Science

University of Salahaddin

Subject: Data Structures

Course Book – Second stage / course II)

Lecturer's name: MSc. Nasreen Thabit Na'mma

Academic Year: 2020/2021

Course Book

1. Course name	Data Structures in C++
2. Lecturer in charge	MSc. NasreenThabitNa'mma
3. Department/ College	Computer/Science
4. Contact	*nisreen.alshaaban@su.edu.krd*
5. Time (in hours) per week	Theoretical: 2 Practical: 2
6. Office hours	2
7. Course code	
8. Teacher's academic profile	https://sites.google.com/a/su.edu.krd/nasreen-thabit/
9. Keywords	Data structure

10. Course overview:

      Data structures provide a means to manage large amounts of data for use in databases and internet indexing services. Efficient data structures are key for designing efficient algorithms and obtaining maintainable software design.

      The course consists of two parts (theoretical and practical). And this will focus on algorithms, analysis, and the use advanced data structures. Among the specific data structures are covered linked lists, trees and graphs. Finally, some standard computer science algorithms (sorting and searching) will be discussed.

11. Course objective:

- **Provide an overview of programming languages and problem solving techniques.**
- **Develop programming skills with the understanding of the fundamentals and basics of C++ Languages.**
-
- **Describe how linked structures, trees are represented in memory and used by algorithms.**
- **Describe common applications for linked structures, trees.**
- **Enable the uses the memory management concepts.**
- **Understand dynamic memory management techniques**
- **Impart knowledge about data structures including linked lists and binary tree.**
- **Write programs that use trees and linked lists**
- **Use pointers to overcome the memory access problems.**
- **To impart a thorough understanding of non-linear data structures such as trees their applications.**

- **Implement sorting and searching techniques in data structure.**

12. Student's obligation

   Attendance is required. Pop quizzes may be given on assigned reading and on material covered in classes. Cell phones must be silent during class. Questions are encouraged - raise your hand to be recognized. Try to formulate the question before asking it, and wait to see if it is answered in a few minutes so we can maintain flow. Lengthy discussions will be deferred to office hours.

13. Forms of teaching
- **The lecture method by writing and speaking**
- **Using DataShow**
- **Demonstrating through examples**
- **Cooperative Group Assignments**
- **Making quiz for feedback**

14. Assessment scheme

The grade will be based upon the following criteria:

One closed book exam (theoretical) ------------------- 15 %

One closed book exam (practical) --------------------- 35 %

Final exam   -- 50 %

15. Student learning outcome:

- **Be able to use and implement fundamental data structures including stacks, queues, lists, trees and graphs.**

- **Learn to use recursion to solve problems.**

- **Implement/ utilize various data structures using a programming language such as C++.**

- **Learn various searching and sorting techniques.**

- **Learn about dynamic memory allocation**

- **Be stronger programmer**

- **To develop proficiency in the specification, representation, and implementation of Data Types and Data Structures.**

- **To get a good understanding of applications of Data Structures.**

- **To develop a base for advanced computer science study.**

- **To define basic static and dynamic data structures and relevant standard algorithms for them: stack, queue, dynamically linked lists, trees, graphs, sorting algorithms, min-max algorithm.**

- **To demonstrate advantages and disadvantages of specific algorithms and data structures**

16. Course Reading List and References:

- Baluja, G., S., 2008, *Data Structures Through C++,* DHANPAT RAI & CO.(P) LTD, Delhi

- Reema Thareja, 2014, *Data Structures using C,* Published in India by Oxford University Press

17. The Topics:

Week(s)	Basic Tutorial Subject to be covered	Lab
1-5	**Linked Lists:** Introduction and representations, Single Linked List (insertion, deletion, and Applications), Circular Single Linked List (insertion, deletion, and Applications), Double Linked List (insertion, deletion, and Applications). Circular Double Linked List (insertion, deletion, and Applications).	• **Operations on Single Linked List (traversing, insertion, deletion)**
6-10	**Trees:** Introduction, Binary Tree, Operations on Binary Tree Scan Binary Tree, Representation of Arithmetic expressions using trees, Binary Search Tree.	• **Operations on Double Linked List (traversing, insertion, deletion)**
11-12	**Midterm Exam**	
13	**Search Algorithms:** Sequential and Binary Search	**Operations on BT (Insertion, Search, Preorder traversal, Inorder, Postorder)**
14	**Sorting Algorithms:** Bubble, Insertion, and Quick Sorting	**Search Algorithms. Sorting Algorithms**
	Final Exam of course II	

19. Examinations:

Compositional:

1. **Which is sorting algorithm belongs to class of divide-and-conquer algorithms?**

   Ans: Quick sort algorithm

2. **What are the disadvantages of Dynamic storage Allocation?**

   Ans: Require more memory storage, since each piece of data stored with the pointer (link) for the next element.

Multiple choices:

1. **In which time that the static storage allocation is done**

   a. run time   b. compiler time

ans: b