CS - 301 (Data Structures & Algorithms)

Fourth Semester

Course Description

Course Code Number	**CS-301**	**Course Title**	**Data Structures & Algorithms**
Semester Hours	Total 4 hours per week Lecture 2 hours per week Lab 2 hours per week	**No. of Credit Units**	3
Pre-requisite	**CS-202**	**Course Coordinator**	Dr. Thida Win Faculty of Computer Science
Course Length	15 Weeks	**Type of Instruction**	Lecture + Lab

Course Description

This course covers techniques for the data structures and algorithms analysis. The course aims to enable the student to understand in-depth data structures and to know how to apply them to resolve practical issues. It also aims at teaching students how to analyze algorithms performance. Topics include: Array, Link List, Stack and Queue, Sorting, Recursion, Binary Trees, Hash Tables, Heaps, Graphs and Weighted Graphs.

Course Objectives

The aims of this course:

- To introduce various techniques for representation of the data in the real world
- To design and implement various data structures and algorithms
- To develop application by applying data structures and algorithms
- To understand algorithms and its analysis procedure
- To understand space and time complexity of various algorithms

Learning Outcomes

Student will be able to

- Select appropriate data structures as applied to specified problem definition.
- Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures
- Calculate the time complexity which is a key concept for evaluating the performance of algorithms
- Determine and analyze the complexity of given algorithms

Text Books:

1. Data Structures & Algorithms in Java (Second Edition) by Robert Lafore

2. Data Structures with Java (Second Edition) by John R. Hubbard

References:

1. Data Structures and Algorithms Analysis in Java (Third Edition) by Mark Allen Weiss
2. Object-Oriented Data Structures using Java by Nell Dale, Daniel T. Joyce, Chip Weems
3. Data Structures and Algorithms in Java (Fourth Edition) by Michael T. Goodrich, Roberto Tamassia

Course Organization

Student participation in the course will involve the following activities:

1. Attending the lectures
2. Tutorial
3. Assignment
4. Practical assignments
5. Moodle/Quiz
6. Exams

Assessment plan for the course

1.	Paper Exam	50%
2.	Attendances	10%
3.	Tutorial / Assignments	15%
4.	Lab	10%
5.	Moodle/Quiz	15%

Grading System

UCSY follows a letter grade system comprising of grades A, A-, B+, B, B-, C+, C, C-, D and F. All marks obtained by students during the semester will be used in the grading process. A grade of "C" or better is required in this course because it is a prerequisite for other courses in the program. **The student who gets the grade point less than 2 must sit Re-Exam.**

The grading scale for this course is:

Marks obtained	Letter Grade	Grade Point
>=90	A	4
85 – 89	A-	3.75
80 – 84	B+	3.25
75 – 79	B	3
70 – 74	B-	2.75
65 – 69	C+	2.25
60 – 64	C	2
55 – 59	C-	1.75
50 – 54	D	1
0 – 49	F	0

Fail Grade and Re-Exam: C-, D, F (Grade point <2)

Class Attendance and Participation Policy:

- **Attendance :** Class attendance is **mandatory**. Most of the material you will learn will be covered in the lectures, so it is important that you not miss any of them. You are expected to show up on time for

class, and stay for the whole lecture. Students are expected to attend each class, to complete any required preparatory work (including assigned reading) and to participate actively in lectures, discussions and exercises.

- Mobile phones **must** be silenced and put away for the entire lecture unless use is specified by the instructor. You may not make or receive calls on your cell phone, or send or receive text messages during lectures.
- You are responsible for all material sent as email. Ignorance of such material is no excuse. You are responsible for all materials presented in the lectures.
- Your conduct in class should be conducive towards a positive learning environment for your class mates as well as yourself.

- **Assignments, Quizzes, Labs and Test with Moodle**

Students take a short 3 to 5 quiz for every lecture and 10 or 20 points quiz / Moodle test after each lecture or chapter. The intent of the quiz/Moodle is to discover early where the areas of misunderstanding may lie. They will account for 20% of the student's grade. The Any assignment or quiz is simply missed, regardless of the reason why (e.g. illness, work, traffic, car trouble, computer problems, death, etc.), and earns a grade of zero. You are strongly encouraged to complete all assignments and attend all quizzes so that you can check that you understand the material and can throw out bad grades, or grades for which you had to miss an assignment or quiz for a valid reason. Late submissions will not be accepted for any graded activity for any reason. Students will have the opportunity to review the quizzes and see the correct answers once they have been graded. Student need to answer test which will announce by lecturer.

- **There are no extra credit opportunities.**

Students may not do additional work nor resubmit any graded activity to raise a final grade.

- **Test**

Test will start after one or two chapters finished and the coordinator will announce the date for the test.

- **Exam**

The exam will be conducted on-campus, in a classroom. The dates/times/locations will be posted on Board as soon as possible.

For this course, the following additional requirements are specified:

All work submitted for a grade must have been prepared by the individual student. Students are expressly prohibited from sharing any work that has been or will be submitted for a grade, in progress or completed, for this course in any manner with a person other than the instructor and teaching assistant(s) assigned to this course). Specifically, students may not do the following, including but not limited to:

- Discuss questions, example problems, or example work with another person that leads to a similar solution to work submitted for a grade.
- Give to, show, or receive from another person (intentionally, or accidentally because the work was not protected) a partial, completed, or graded solution.
- Ask another person about the completion or correctness of an assignment.
- Post questions or a partial, completed, or graded solution electronically (e.g. a Web site).

- All work must be newly created by the individual student for this course. Any usage of work developed for another course, or for this course in a prior semester, is strictly prohibited without prior approval from the instructor.
- Posting or sharing course content (e.g. instructor provided lecture notes, assignment directions, assignment questions, or anything not created solely by the student), using any non-electronic or electronic medium (e.g. web site, FTP site, any location where it is accessible to someone other than the individual student, instructor and/or teaching assistant(s)) constitutes copyright infringement and is strictly prohibited without prior approval from the instructor.

Tentative Lecture Plan

No.	Topics	Week	Remark
	Overview	**Week 1**	**Chapter 1**
1	Overview of Data structure Overview of Algorithm Java Library Data Structure		
	Arrays	**Week 1+ 2**	**Chapter 2**
2	Basic of Array Ordered Array Big O notation Questions and Review Lab examples and exercises		
	Simple Sorting	**Week 2 + 3**	**Chapter 3**
3	Bubble Sort Selection Sort Insertion Sort		
4	Comparing the Simple Sorts Questions and Review Lab examples and exercises		
	Stacks and Queues	**Week 3 + 4**	**Chapter 4**
5	Stack Queue Priority Queue Questions and Review Lab examples and exercises		
	Linked Lists	**Week 4 + 5**	**Chapter 5**
6	Simple Link List Double Ended List Abstract Data Type Sorted List Doubly Linked List Questions and Review Lab examples and exercises		
	Recursion	**Week 5 + 6**	**Chapter 6**
7	Characteristics of Recursive Methods Triangular Numbers Mathematical Induction Recursive Examples		
8	A Recursive Binary Search		

	Divide-and-Conquer Algorithms Merge sort Question and Review Lab examples and exercises		
	Binary Trees	**Week 7 + 8**	**Chapter 8**
9	Tree Terminology Binary Trees Binary Search Trees		
10	Traversing the Tree Inorder Traversal Preorder Traversal Postorder Traversals The efficiency of Binary Trees		
11	Finding Maximum and Minimum Values Deleting a Node Trees Represented as Arrays Chapter Review Lab examples and exercises		
	Hash Tables	**Week 9 +10**	**Chapter 11**
12	Hash table Hashing Collisions Clustering Quadratic Probing		
13	Double Hashing Separate Chaining Hashing Efficiency Chapter Review Lab examples and exercises		
	Heaps	**Week 11+12**	**Chapter 12**
14	Introduction Heap Sort The Efficiency of Heapsort Chapter Review Lab examples and exercises		
	Graphs	**Week 12+13**	**Chapter 13**
15	Definitions Depth-First Search Breadth-First Search Chapter Review Lab examples and exercises		
	Weighted Graphs	**Week 14+ 15**	**Chapter 14**
16	Minimum Spanning Tree Shorted Path Chapter Review Lab examples and exercises		
	When to use what	**Week 15**	**Chapter 15**
17	Overview Chapter Review exercises		