CSE221: Algorithms
Lab Outline and Activity Plan

General Information:

Course ID: CSE221
Course Title: Algorithms
Credits: 3
Course Prerequisite: CSE220

Course Overview:

From this course, students will learn about some basic types of algorithms used in computer science. They will mainly learn different sorting and search algorithms, graph algorithms, greedy and dynamic algorithms. In addition, they will gather knowledge about analyzing the complexity of any problem. This course will help the students to develop an understanding of how to solve a problem by first mapping it to any known algorithm or problem domain. In the lab the student will implement the algorithms they learn in class in Java.

Learning Outcome:

By the end of this course, students will be able to understand and implement:

- Complexity analysis.
- Sorting and searching algorithms.
- Graph algorithms.
- Greedy and Dynamic algorithms.
- Geometric Computation based problems.
- Advanced Data structures.

Teaching-Learning Methodology

There is a weekly 3 hour lab session that is mandatory for students, and contributes towards 25% of their final grade for the course. The lab is designed as a combination of classwork, exams and home assignments. The students are explained the class work at the beginning of each class, which they then complete within the lab. They are also assigned homeworks related to the class task which they have to submit within 1 or 2 weeks.

Required Course Material:

a) Reference Books:
   i) CLRS - Introduction to Algorithms, By Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein. ISBN: 9780262033848
   ii) HSR - Computer Algorithms, By Ellis Horowitz , Sartaj Sahni, Sanguthevar Rajasekaran. ISBN: 9780929306414
b) Lecture Slides: Lecture slides will be periodically posted on TSR.

Tentative Class Plan

Week No.	Topic	Objective
Week 1	Learning Graph	Students will be introduced to the basics of graph. How to represent a graph in Adjacency Matrix and Adjacency List. They have provided a graph package class which they have to use to built the graph adjacency matrix and list representation in an object oriented programming way. In that package they are provided with the vertex and edge class along with some corresponding methods help them to built the graph package.
Week 2	Implementing Sorting algorithms(merge , quick, heap)	Students will be introduced with the Sorting algorithms. In this lab they actually looking at the pseudo code of the sorting algorithms and will implement it. They will also compare the running time with the other sorting modules with the same input and output modules.
Week 3	Graph with sorting based problems	Students will be taught how they can use sorting algorithms in the graph module they developed and try to fit their solution to solve a problem needed the sorting analysis with efficient coding. They also verify the time complexity of different modules
Week 4	Obstacle avoiding BFS(Breadth First Search)	Students will try to learn how to implement breadth first search algorithm to avoid obstacles in a path. They first try to develop a knowledge of a grid to forming graph then they need to perform the BFS algorithm to trace out a path which leads them to avoid obstacles.
Week 5	Gold Mining DFS(Depth First Search)	Students will try to learn how to perform DFS (Depth first search) algorithm for the maze mining of a deserted island problem. It is an implementation of Connected Component counting problem
Week 6	Lab Midterm	Code segment time complexity and a problem is given to solve within the lab
Week 7	Kruskal Implementation	Students will given a problem where they need to formulate the inputs in a pattern way and pass their implementation of the kruskal algorithm to find out the MST as a solution of the problem.
Week 8	Prim Implementation	Students will learn the vertex approach to find the MST of the problem learned in the previous lab.
Week 9	Multiple LCS(Longest Common Subsequence)	Students will implement multiple sequence alignment problem through LCS. After the class they will understand how the DNA sequence gets scored while alignment matches.
Week 10	Linear Hashing Implementation	An advance ADT to store caching mechanism is being introduced to the students by the lab.

Week 11	Shortest Path Problem	Map is given to find the shortest route from one corner to another. Dijekstra or Bellmanford algorithm could be used. Students needs to figure out which will lead them to the solution.
Week 12	0/1 knapsack(A day for the thief)	Simple Implementation of 0/1 Knapsack for the students
Week 13	Final Exam/Viva	Students will sit for an exam or viva

Evaluation:

Total : 25

Assignment: 13
Quiz: 12

General Policy:

Grading criteria:
The grades at the University will be indicated in the following manner:
90 - 100 = A (4.0) Excellent
85 - <90 = A- (3.7)
80 - <85 = B+ (3.3)
75 - <80 = B (3.0) Good
70 - <75 = B- (2.7)
65 - <70 = C+ (2.3)
60 - <65 = C (2.0) Fair

57 - <60 = C- (1.7)
55 - <57 = D+ (1.3)
52 - <55 = D (1.0) Poor
50 - <52 = D- (0.7)
<50 = F (0.0) Failure

Grades without Numerical Value:

P: Pass
A course may be taken for a pass/fail grade providing that the instructor approves the option and the student carries 12 credits for regular letter grades in that semester.
I: Incomplete
Incomplete is assigned only when a student has failed to complete one or more requirements of the course for an unavoidable reason/accidental circumstance and has applied for I grade.
W: Withdrawal
Withdrawal is assigned to a student who withdraws from the course within the deadline for withdrawal with 'W' grade.

Attendance Policy:

Attendance and punctuality are equally important as participation in class. Late comers are considered absent. Students are given no permission to be absent for any reasons other than sickness or illness of some kind. However, students are required to prove that they were sick or ill to be given consideration for their absence. If a student fails to maintain 70% attendance, s/he will be barred from the course. However, in case of illness (keeping in accordance with BRACU policy), exceptions can be made.

Latecomer Policy:

In case of late submission, grading rules adopted and followed in the department will be applicable to this course. Cause of late submission or absence has to be well supported by appropriate documents.

Gender Policy:

Gender equity among male and female students in class will be maintained as per the BRAC University concern and BRAC's consistent endeavors on women empowerment. Therefore, all students will be evaluated equally based on their performance in the course concerned regardless of their gender.

Inclusive Education Policy Statement:

Each of the students shall be given equal access to laboratory resources, relevant materials and consultation hours, free from discrimination based on gender, language, sexual orientation, pregnancy, culture, ethnicity, religion, health or disability, socioeconomic background or geographic location, as per the inclusive education policy of Bangladesh.