University of Computer Studies, Yangon
B.C.Sc. (Fifth Year)

CS-504(Computing Applied Algorithms) (Elective)

Course Description

Course Code	CS-504	**Course Title**	Computing Applied Algorithms
Semester Hours	3 hours per week Lecture 2 hours Practical hour	**No. of Credit Units**	3
Prerequisites	CS-403	**Course Coordinator**	Dr. Win Lelt Lelt Phyu, Professor Faculty of Computer Science

Course Description

The study of algorithms is at the very heart of computer science. In this course students will learn about the searching algorithms, the graph algorithms and parallel algorithms. The emphasis will be on algorithms that can be used on some of the data structure for set manipulation problems, principal graph problems, model of computation and fundamental parallel algorithms for merging and sorting.

Course Objectives

The main purpose of this course is

- To know data structures for set manipulation problems
- To know the concept of algorithms on graph
- To know the fundamental concepts and techniques of parallel computing.
- To learn how to design and analyze parallel algorithms to solve given problems in specific parallel computation models

Learning Outcomes

Upon successful completion of the course the student:

- will know the structure and properties of a binary search tree and optimal binary search tree
- will be familiar with the some of the principal graph problems
- will be familiar with the concepts of parallel processing and understand the particular problems arising in programming of parallel machines;
- will be familiar with the parallel computing models and the “parallel-way of thinking” required in the design of parallel algorithms;
- will be able to use the metric of running time, number of processors, cost, speed-up and efficiency to analyze the performance of given parallel algorithms and compare between them
- will be able to understand and use basic sorting and merging parallel algorithms

Reference Materials:

(1) Design and Analysis of Computer Algorithms by Alfred V. Aho, John E. Hopcroft & Jeffery D. Ullman

(2) Design and Analysis of Parallel Algorithms, by Selim G. Akl

Internet Sources

- **https://computing.llnl.gov/tutorials/parallel_comp/**
- **https://www.geeksforgeeks.org/binary-search-tree-set-1-search-and-insertion/**
- **https://www.tutorialspoint.com/data_structures_algorithms/spanning_tree.htm**

Course Organization

Your participation in the course will involve six forms of activity.

1. Attending the lectures
2. Class participation and presentation
3. Practical assignments
4. Reading assignments
5. Exam
6. Quiz

Assessment

Exam	50%
Tutorials/Moodle (2 times)	10%
Attendance	10%
Quiz	5%
Presentation /Assignment	10%
Project	15%

Tentative Schedule

45 Periods for 15 weeks (50 minutes for 1 period)

No.	Title & Contents	Credits	Reference Book & Chapter
1	**Subject Introduction**	**1**	All Chapters Book (1& 2)
2	**Algorithms using Tree Data Structure & Graphs**	**18**	Book (1)
	Binary Search Trees	1	Chapter 4, Section 4.4
	Optimal Binary Search Trees	3	Chapter 4, Section 4.5
	Minimum Cost Spanning Trees	2	Chapter 5, Section 5.1
	Depth-first-search(undirected graph)	2	Chapter 5, Section 5.2
	Depth-first-search(directed graph)	2	Chapter 5, Section 5.4
	Biconnnectivity	2	Chapter 5, Section 5.3
	Strong connectivity	2	Chapter 5, Section 5.5
	Path-finding problem	2	Chapter 5, Section 5.6
	A transitive closure algorithm	1	Chapter 5, Section 5.7

	A shortest-path-algorithm	1	Chapter 5, Section 5.8
3	**Parallel Computing**	**7**	Book (2)
	The need for parallel computer, Models of Computation (SISD Computers)	1	Chapter 1 Section 1.1, 1.2, 1.2.1
	Models of Computation (MISD Computers)	1	Chapter 1, Section 1.2.2
	Models of Computation(SIMD)	3	Chapter 1 Section 1.2.3
	Models of Computation(MIMD), Analyzing Algorithms • Running Time • Number of processors • Cost	2	Chapter 1 Section 1.2.4, 1.3
4	**Merging**	**9**	
	Merging on the CREW Model • Sequential Merging, • Parallel Merging	3	Chapter 3 Section 3.3
	Merging on the EREW Model	3	Chapter 3 Section 3.4
	A better algorithm for the EREW Model • Finding the median of two sorted sequences • Fast Merging on the EREW Model	3	Chapter 3 Section 3.5
5	**Sorting**	**7**	
	Sorting on the CRCW Model	1	Chapter 4, Section 4.4
	Sorting on the CREW Model	3	Chapter 4, Section 4.5
	Sorting on the EREW Model	3	Chapter 4, Section 4.6
6	**Mini Project Presentation**	**3**	