



Summer Term - 2022
CS F211 (Data Structures and Algorithms)
Course Handout Part II

Date: 28th May 2022

In addition to Part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : CS F211
Course Title : Data Structures & Algorithms
Instructor-in-Charge : Sameera Muhamed Salam

Scope and Objective of the Course:

The main objective of this course is to introduce structures for storing data and algorithms for retrieving/manipulating data. It incorporates techniques for designing such structures. The course covers design, implementation and applications of data structures including linked lists, stacks, queues, heaps, hash tables, balanced binary search trees, and graphs. This course also introduces mathematical and experimental techniques for analyzing the complexity of algorithms. The course discusses sorting and searching algorithms with detailed analysis on complexity of algorithms. The course introduces algorithm design techniques like Divide and Conquer, Greedy, Dynamic Programming to solve various interesting problems.

At the end of the course the student should be able to

- Understand Asymptotic notation and apply the same to analyze algorithms.
- Understanding of basic data structures with the complete analysis and implementation details.
- Understanding of sorting and searching algorithms.
- Understanding of basic algorithmic techniques.
- Apply appropriate data structure and algorithms to solve problems.

Textbooks:

- T1.** Cormen TH, Leiserson CE, Rivest RL, and C Stein. **Introduction to Algorithms**. MIT Press Second Edition (India reprint: Prentice-Hall 2009).

Reference books

- R1.** Micheal T Goodrich and Roberto Tamassia. **Algorithm Design: Foundations, Analysis and Internet examples**. (John Wiley & Sons, Inc., 2002).
- R2.** Jon Kleinberg and Eva Tardos. **Algorithm Design**. Pearson Education. (2007).
- R3.** Sanjoy Das Gupta, Christos Papadimitriou, Umesh Vazirani, **Algorithms**. Tata McGraw-Hill Publishers.

Course Plan:



Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
1-2	To introduce data structures and algorithms	Course Introduction & Motivation.	T1-1
3 - 6	To understand analysis of algorithms	Growth of Functions & Asymptotic Notation, Simple Case Studies: Binary search & Bubble Sort	T1-2,3,4 R1-1
7-8	To understand Divide and Conquer Algorithmic Technique	Divide & Conquer, Merge Sort & Quick Sort (Analysing lower bounds)	T1-7 R2 – 5
9-10	To understand Linear time sorting algorithms	Linear time Sorting Algorithms – Radix Sort and Bucket Sort (Analysing lower bounds)	T1 – 2, 6, 8 R1- 4
11 – 16	To understand basic datastructures, their implementations, Complexity, Efficiency & Applications	Linked Lists, Types of Linked Lists, Stack ADT, Queue ADT, Double ended Queue , Vectors, Lists & Sequences	T1-10 R1-2
17-18	To understand Tree Data Structure	Tree ADT, Binary Tree, Types of Binary tree,	R1 - 2
19 - 22	To understand Advanced data structures like Priority queues, Heaps, Hash tables, Maps, Skip lists, Dictionaries, Search Trees.	Priority Queue ADT, Heaps, Applications of heap: Insertion Sort, Selection Sort & Heap Sort	
23 - 24		MAP ADT, Dictionaries and Hash Tables, Separate Chaining vs. Open Addressing, Probing, Rehashing.	T1 – 11 R1- 2
25 - 30		Binary Search Tree, Balanced Binary Search Trees - Red-Black Trees, Skip list (Implementation, Complexity & Efficiency)	T1 – 12, 13 R1- 3
31 - 36	To understand String Manipulation and Dynamic Programming Algorithmic Technique	Trie Data Structure, Pattern Matching Algorithms, LCS using Dynamic Programming	T1 – 4,15, 32 R1- 9
37 - 38	To understand Graph Data Structure and Greedy Algorithmic technique	Graphs ADT& Graph Algorithms: Representation schemes, Traversals: DFS and BFS	T1 – 22, R1 - 6
39 - 42		Greedy Algorithms: Shortest path and MST (Dijkstra, Kruskal, and Prim-Jarnik algorithms.)	T1- 23, 24 R3 – 4,5

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid Test	90 minutes	25%	24/6 3.30 -5.00 PM	Closed Book
Lab – Continuous Evaluation & Final Test	Every assignment will be evaluated. Final lab examination will be of one hour	35% (Assignments by Continuous Evaluation (25%) & Final Lab Test (10%))	To be declared	Open Book
				Open Book
Comprehensive	3 hours	40%	23/07 FN	Closed Book

Note: minimum 40% of the evaluation to be completed by midsem grading.

Chamber Consultation Hour: Monday (5 PM to 6 PM) Room No: H107

Notices: All notices pertaining to this course will be displayed on the CS & IS Notice Board.

Make-up Policy: Prior Permission is must and make-up shall be granted only in genuine cases.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

INSTRUCTOR-IN-CHARGE
CS F211

