Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER 2022-2023

Course Handout Part II

Date:16-01-2023

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	: N.L.BHANU MURTHY
Team of Instructors	: N.L.Bhanu Murthy
	Barsha Mitra
	Paresh Saxena
	Raghunath Reddy M
	Sameera Muhamed Salam

Scope and Objective of the Course:

The main objective of this course is to introduce structures for storing data and techniques 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 T.H., Leiserson, C.E., Rivest, R.L., and C. Stein. ***Introduction to Algorithms,*** *MIT Press,* Second Edition (*Indian reprint: Prentice-Hall).*

Reference books

T1. 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 – 4	To understand analysis of algorithms	Growth of Functions & Asymptotic Notation	T1 – 2,3,4
5 - 13	To understand sorting algorithms	Sorting Algorithms – Bubble Sort, Quick Sort, Insertion Sort, Merge Sort, Heap Sort, Radix Sort and Bucket Sort Lower Bound on Complexity of Sorting Algorithms	T1 – 6, 7, 8
14 - 16	To understand selection techniques	Selection Algorithms, MoM problems	T1 - 9
17 – 25	To understand base data structures	Data Structures – Stacks, Queues, Trees, Priority Queues, Linked Lists, Heaps, (Approaches, Implementation Issues, Complexity & Efficiency)	T1 – 10
27 – 28	To understand hash tables	Data Structures – Hash Tables (Separate Chaining vs. Open Addressing, Probing)	T1 – 11
29 – 30	To understand binary search trees	Data Structures –Binary Search Tree, Balanced Binary Search Trees - Red-Black Trees Skip list (Approaches, Implementation Issues, Complexity & Efficiency)	T1 – 12, 13
31 – 38	To understand algorithm techniques	Algorithm Techniques – Divide & Conquer, Greedy, Dynamic Programming, Back Tracking and Branch & Bound	T1 – 4, 15, 16
39 – 41	To understand graph algorithms	Graphs & Graph Algorithms: Representation schemes, Traversals, Problems on Weighted Graphs - Shortest Path Algorithms: Dijkstra's etc.)	T1 – 22, 24

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid Test	90 minutes	25%	14/03 9.30 - 11.00AM	Partly Open Book (15% Open Book)
Lab – Continuous Evaluation	Every assignment will be evaluated.	25% (Assignments by Continuous Evaluation (25%))	TBD	Closed Book
Lab Test	2 hours	10%	TBD	Open Book
Comprehensive	3 hours	40%	10/05 FN	Closed Book

Chamber Consultation Hour: Tuesday 1700Hrs–1800Hrs @H119

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 based on individual's need, circumstances. The recommendation from chief warden is necessary to request for a make-up.

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