भारतीय सूचना प्रौद्योगिकी संस्थान, नागपुर
Indian Institute of Information Technology, Nagpur
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Department of Computer Science and Engineering
Teaching Plan

Branch	CSE/CSE-AIML/CSE-HCIGT/CSE-DSA/ECE			
Course Name & Code	Data Structures with Applications (CSL201)			
Semester	III			
Type	DC			
Academic Year	2024-2025			
Course Coordinator/(s)	Dr. Richa Makhijani Dr. Amol Bhopale Dr. Aishwarya Ukey Mrs. Ruchira Selote			
Credits	L	T	P	Credits
	2	0	2	03

Lecture No.	Topic
	Module 1
1	Applications of lists: Polynomial representation
2	Multi-precision arithmetic
3	Radix Sort using linked list
4	Multi linked representation of Sparse matrices
5	Priority Queues and its implementation
	Module 2
6	Introduction to Height-balanced tree and AVL trees, Properties, Various Rotations
7	Insertion and deletion operation in AVL Tree
8	Introduction to Heaps, Min/Max Heap, Array Representation, Construction
9	Heapify algorithm, Search, Insert and Delete operation on Heap
10	Heap Sort and its time complexity
	SESSIONAL 1
11	Overview of Multi-way trees, Introduction to B-Trees, Search, Insertion and Deletion operation on B-Trees

12	Introduction to B+ trees, Search
13	Insertion and deletion operations on B+ Trees
14	Red-Black Tree: Properties, Rotations, Various Imbalances-LRr Imbalance/LLr Imbalance/RRr Imbalance/RLr Imbalance
15	Insertion and Deletion Operation, Problems based on RB Tree
16	Splay Tree: Properties, Rotations - Zig Rotation, Zag Rotation, Zig-Zig Rotation, Zag-Zag Rotation, Zig-Zag Rotation, Zag-Zig Rotation
17	Various operation–Splaying, Join, Split, Insertion, Deletion
18	External Sorting, External merge sort, Multiway Merge
	SESSIONAL 2
	Module 3
19	Tries, Standard Tries, Properties, Compressed Tries, Compression algorithm
20	Compact representation, Insertion and Deletion operation, Suffix trees
21	Introduction to Segment Trees, Various operations on Segment Trees
22	Skip List: Structure, Search, Insert, Delete operations
23	Perfect skip list, Randomized skip list, Implementation, Applications
24	Disjoint Sets Data Structure, Representation, Operations- MakeSet, Find, Union, Time complexity, Implementation, Application
	Module 4
25	Graphs: Introduction to Graphs, Directed/Undirected graphs, Graph Representations - Adjacency matrix, Adjacency lists
26	Overview of Traversals (BFT, DFT, Topological Sort)
27	Dijkstra's Shortest Path Algorithm
28	All-pairs shortest paths – Floyd Warshall algorithm
29	Minimum spanning trees, Kruskal and Prim's Algorithm
30	Huffman Coding, Introduction to Network Flow Problem
	END SEM EXAM

Lab Assignments:

Sr. No.	Name of the Topic	No. of labs required
1	Applications of Linked List- Polynomial representation and arithmetic operations/ Multi-precision Arithmetic using Linked List	1
2	Use linked list for implementation of Sparse Matrix / Radix sort for the same elements given above. Deduce the time complexity T(n) for the best, worst and average cases	1
3	Implementation of height balanced trees.	1

4	Write a program to implement Heap sort by building a heap for the given set of elements and then deleting one element at a time. Show the complexity of your code.	1
5	Implementation of B/B+trees.	1
6	Implementation of Red black/sparse trees.	1
7	Implementation of suffix tries/ segmant tries/ skip list.	1
8	Dijkstra's Shortest Path Algorithm using graph traversals.	1
9	All-pairs shortest paths – Floyd Warshall algorithm	1
10	Minimum spanning trees, Kruskal and Prim's Algorithm	1
		Total=10

Theory Evaluation Plan

Sr. No	Evaluation based on	Weightage
1.	Sessional exam 1	15 Marks
2.	Sessional exam 2	15 Marks
3.	End semester exam	50 Marks
4.	Quiz / Attendance	20 Marks

Lab Evaluation Plan

Sr. No.	TA Type	Tentative Schedule	Marks
1.	Lab Assessment	Throughout the semester	30
2.	Lab Exam 1	After Sessional 1	20
3.	Lab Exam 2	After Sessional 2	20
4.	Lab Exam 3	Before End Semester Exam	20
5.	Attendance	Throughout the semester	10
		Total=100 (To be scaled down 25)	

Course Co-ordinators:

Sr. No.	Branch/Section	Name of Faculty	Sign
1	CSE-A	Dr. Amol Bhopale	
2	CSE-B & CSE-HCIGT	Dr. Richa Makhijani	
3	CSE-DSA	Dr. Aishwarya Ukey	
4	CSE-C & CSE-AIML	Mrs. Ruchira Selote	