ABES
Estd. 2000

Data Structure (KCS 301)

Day 1

University Syllabus (AKTU)

DETAILED SYLLABUS		3-1-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Basic Terminology, Elementary Data Organization, Built in Data Types in C. Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big Oh, Big Theta and Big Omega, Time-Space trade-off. Abstract Data Types (ADT) **Arrays**: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D,2-D,3-D and n-D Array Application of arrays, Sparse Matrices and their representations. **Linked lists:** Array Implementation and Pointer Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition Subtraction & Multiplications of Single variable & Two variables Polynomial.	08
II	**Stacks:** Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Iteration and Recursion- Principles of recursion, Tail recursion, Removal of recursion Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers. Tradeoffs between iteration and recursion. **Queues:** Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.	08
III	**Searching:** Concept of Searching, Sequential search, Index Sequential Search, Binary Search. Concept of Hashing & Collision resolution Techniques used in Hashing. **Sorting:** Insertion Sort, Selection, Bubble Sort, Quick Sort, Merge Sort, Heap Sort and Radix Sort.	08
IV	**Graphs:** Terminology used with Graph, Data Structure for Graph Representations: Adjacency Matrices, Adjacency List, Adjacency. Graph Traversal: Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm.	08

University Syllabus (AKTU)

V	**Trees:** Basic terminology used with Tree, Binary Trees, Binary Tree Representation: Array Representation and Pointer(Linked List) Representation, Binary Search Tree, Strictly Binary Tree ,Complete Binary Tree . A Extended Binary Trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Constructing Binary Tree from given Tree Traversal, Operation of Insertation , Deletion, Searching & Modification of data in Binary Search . Threaded Binary trees, Traversing Threaded Binary trees. Huffman coding using Binary Tree. Concept & Basic Operations for AVL Tree , B Tree & Binary Heaps	08

Course Outcomes (As per AKTU)

ABES Engineering College, Ghaziabad
Department of CSE/IT/CS/ CSDS/CSEAIML

Data Structure (KCS-301)

Academic session: 2022-23

Semester: III **Year: II**

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to:		
CO 1	Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented in memory, used by the algorithms and their common applications.	**K1, K2**
CO 2	Discuss the computational efficiency of the sorting and searching algorithms.	**K2**
CO 3	Implementation of Trees and Graphs and perform various operations on these data structure.	**K3**
CO 4	Understanding the concept of recursion, application of recursion and its implementation and removal of recursion.	**K4**
CO 5	Identify the alternative implementations of data structures with respect to its performance to solve a real world problem.	**K5, K6**

Course Objectives

- To introduce data abstraction and data representation in memory.
- To describe, design and use of elementary data structures such as stack, queue, linked list, tree and graph.
- To discuss decomposition of complex programming problems into manageable sub problems
- To introduce algorithms and their complexity

Modules to be covered

S. No.	Module Name
1	Introduction
2	Arrays
3	Linked lists
4	Stacks
5	Queues

S. No.	Module Name
6	Searching
7.	Sorting
8.	Graphs
9.	Trees
10	Sparse Matrix

Lecture Delivery Schedule

Program	Sem	Course Name	Course Code	Periods (University)			Evaluation Scheme				Course Total	Credit
				L	T	P	Sessional Marks			UE		
							CT	TA	Total			
B.Tech (CSE/CS/IT/ AIML/CSDS/)	V	Data Structure	KCS301	3	1	0	30	20	50	100	150	4

Periods (Actual)			Name of Faculty	Vertical Head	Date of Commencement	Total lectures planned	Date of Conclusion
L	T	P					
4	0	4			1.09.2022	25(50)	

Assignments / Assessments & Sessional Test

- 100 Mins Lecture
- 90 min lecture followed by 10 min quiz
- Sessional Test 1
- Sessional Test 2
- PUE (Only for detained students)

Mode and marking scheme will be shared soon

Lab Plan

Data Structure using C Lab (KCS351)

Write C Programs to illustrate the concept of the following:

1. Sorting Algorithms-Non-Recursive.
2. Sorting Algorithms-Recursive.
3. Searching Algorithm.
4. Implementation of Stack using Array.
5. Implementation of Queue using Array.
6. Implementation of Circular Queue using Array.
7. Implementation of Stack using Linked List.
8. Implementation of Queue using Linked List.
9. Implementation of Circular Queue using Linked List.
10. Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search Tree, Insertion and Deletion in BST.
11. Graph Implementation, BFS, DFS, Minimum cost spanning tree, shortest path algorithm.

Text and Reference Books, other resources

Book	Author
Data Structures - Schaum's Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.	Lipschutz
Data Structure Using C - Oxford Higher Education.	Thareja
Data Structure Using C - Pearson Education India.	AK Sharma
Data Structure Using C and C++ - Wiley Dreamtech Publication.	Rajesh K. Shukla
Data Structures Using C and C++ - PHI.	Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein
Data Structures and Algorithms in C++ - Wiley India.	Michael T. Goodrich, Roberto Tamassia, David M. Mount
C and Data structure - Wiley Dreamtech Publication.	P. S. Deshpandey
Data Structures and Program Design in C - Pearson Education.	R. Kruse etal

Importance of Data Structure

- In software design, Data structures are known to be major factors for collection, storing and organizing of data rather than algorithms in some programming languages.
- In almost every software system and program, Data structures are often included nowadays.
- Often Data structures are used in the combination of algorithms. This allows the management of large amounts of data in an efficient way.
- It allows users to perform multiple task with ease.

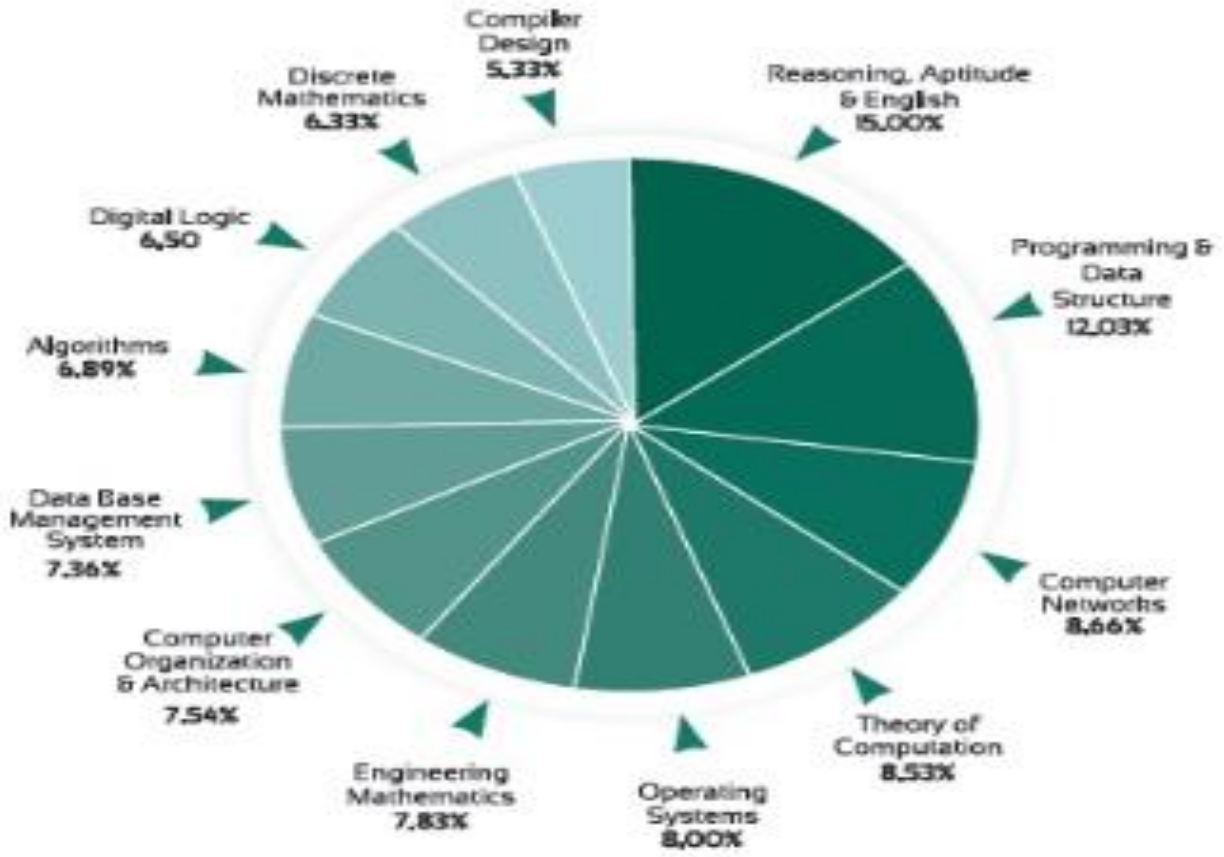
IT Companies Hiring....

GATE (2010-2021) CS & IT Paper – Subject wise Analysis

Topic	1-mark questions	2-mark questions	Total
Algorithms	3	3	6
Data Structuring & Programming	3	3	6
Computer Organization & Architecture	2	3	5
Digital Logic	1	2	3
Computer Networks	3	4	7
Theory of Computation	2	4	6
Database	3	2	5
Compiler Design	1	2	3
Operating Systems	2	2	4
Discrete Mathematics	3	3	6
Engineering Mathematics	2	2	4
General Aptitude	5	5	10
Total			65 questions

Subjectwise weightage in GATE

SUBJECTWISE WEIGHTAGE ANALYSIS OF GATE SYLLABUS



Subject	Average % (last 5 yrs)
Reasoning, Aptitude & English	15.00%
Programming & Data Structure	12.03%
Computer Networks	8.66%
Theory of Computation	8.53%
Operating Systems	8.00%
Engineering Mathematics	7.83%
Computer Organization & Architecture	7.54%
Data Base Management System	7.36%
Algorithms	6.89%
Digital Logic	6.50%
Discrete Mathematics	6.33%
Compiler Design	5.33%
Total	**100%**

References

- https://aktu.ac.in/syllabus%202021-2022.html
- https://nptel.ac.in/courses/106102064
- https://aa.bbs.tr/lab/cen215-data-structures/Data-Structures-Using-C-2nd-edition.pdf
- https://feismo.com/doc-viewer

Thank You