



DSA & Alg 1

DSA & Alg 2

Data Structures:

Linear Data Structures:

- Arrays (fixed-size, dynamic)
- Linked Lists (singly, doubly, circular)
- Stacks (LIFO)
- Queues (FIFO, priority queues, deques)

Non-Linear Data Structures:

- Trees (binary trees, binary search trees, AVL trees, Red-Black trees, heaps, tries)
- Graphs (directed, undirected, weighted, unweighted)
- Hash Tables (hashing, collision resolution)

Sorting Algorithms:

- Comparison-based Sorts:
 - Bubble Sort
 - Selection Sort
 - Insertion Sort
 - Merge Sort
 - Quick Sort
 - Heap Sort
- Non-comparison-based Sorts:
 - Counting Sort
 - Radix Sort
 - Bucket Sort

Searching Algorithms:

- Linear Search
- Binary Search
- Hashing-based Search: (using hash tables)

Tree Traversal Algorithms:

- Breadth-First Search (BFS)
- Depth-First Search (DFS)

Other Important Topics:

Algorithm Analysis (Big O Notation): Time and space complexity analysis

Recursion

Dynamic Programming

Greedy Algorithms

Graph Algorithms: (e.g., Dijkstra's, Prim's, Kruskal's, Bellman-Ford, Floyd-Warshall)

Bit Manipulation: (sometimes included)

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Course Title: Data Structures

Course Description:

This course provides a comprehensive introduction to fundamental data structures essential for efficient algorithm design and problem-solving. Students will explore both linear and non-linear data structures, understanding their implementation, operations, and applications. Topics include arrays, linked lists, stacks, queues, trees, graphs, and hash tables. Emphasis is placed on understanding the characteristics, advantages, and limitations of each structure, along with practical coding exercises to solidify comprehension. By the end of the course, students will be equipped with the knowledge to select and implement appropriate data structures for various computational problems.

Topics Covered:

Linear Data Structures: Arrays (fixed-size, dynamic), Linked Lists (singly, doubly, circular), Stacks (LIFO), Queues (FIFO, priority queues, deques)

Non-Linear Data Structures: Trees (binary, binary search, AVL, Red-Black, heaps, tries), Graphs (directed, undirected, weighted, unweighted), Hash Tables (hashing, collision resolution)

Basic algorithms related to data structures, such as traversal techniques and operations

Course Title: Algorithm Analysis and Design

Course Description:

This course delves into the principles of designing, analyzing, and implementing efficient algorithms to solve computational problems. Students will learn to evaluate algorithm performance using Big O notation, and explore core algorithmic paradigms including divide-and-conquer, greedy algorithms, dynamic programming, and recursion. The course covers a wide range of algorithms, including sorting, searching, graph algorithms, and tree traversals, with an emphasis on understanding their theoretical underpinnings and practical applications. Additionally, students will study advanced topics such as bit manipulation and fundamental algorithm analysis techniques. By the end of the course, students will be capable of analyzing and developing optimized algorithms for complex problems.

Topics Covered:

Algorithm Analysis: Time and space complexity, Big O notation

Searching Algorithms: Linear Search, Binary Search, Hashing-based Search

Sorting Algorithms: Comparison-based sorts (Bubble, Selection, Insertion, Merge, Quick, Heap), Non-comparison sorts (Counting, Radix, Bucket)

Graph Algorithms: Dijkstra's, Prim's, Kruskal's, Bellman-Ford, Floyd-Warshall

Tree Traversals: BFS, DFS

Core Algorithmic Paradigms: Divide-and-Conquer, Greedy algorithms, Dynamic Programming

Recursion and Backtracking

Bit Manipulation (optional, depending on course depth)

Intro Comp > Python I > Python II > AI & Ethics > Machine Learning (selective)

- |> Data visualization > data analysis (selective)
|> Discrete Math
|> Computer Networks
|> Software Engineering

Intro Comp > Data Structure (Java) > Algorithm Analysis (java) > OOP&GUI (abstraction,Java) (selective)

- > Operating systems
> Database Design

Faculty	Fall				Spring										
	Doughan	Gheibi	Malmstrom	Regier	Tran	Data Visualization	Data Structure	OOP&GUI	Computer Networks	Software Engineering	Machine Learning	Algorithm Analysis	AI & Ethics	Operating Systems	Database Design
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* Preferably one professor for both course and same

