Detailed Curriculum

Introduction to Programming

Topics	Sub-topics	Details
Basics of Programming	Flowcharts	Introduction to flowcharts, Decision making using flowcharts, Loops, Example problems
	Variables and Data types	First program, Variables and data types, Taking input, How data is stored in memory, Arithmetic Operators
	Flowcharts	Introduction to If else, Relational and logical operators, Nested conditionals
Loops and Functions	While loops	While loops, Flow of execution of statements in while loop, Example problems using while loop
	Patterns	Introduction to patterns, Basic Patterns, Square Patterns, TriangularPatterns, Character Patterns, Reverse Triangle, Inverted patterns, Isoscelestriangles
	For loops	For loops, Break and Continue, increment - decrement operators
	Functions	Introduction to functions, Working of function calling, Variables and its scope, Pass by value
Arrays	Introduction to arrays	Introduction to arrays, How arrays are stored in memory, Passing arrays to functions
	Searching and Sorting	Understanding Binary Search, Selection sort, Bubble sort, Insertion sort, Merging two sorted arrays
Strings and 2D Arrays	Strings	Introduction to strings, storage of strings and their in built functions
	2D Arrays	2D arrays, Storage of 2D arrays, Example problems using2DArrays
Problem Solving Techniques	Recursion	Introduction to recursion, Principle of mathematical induction,Fibonacci numbers, Recursion using arrays, Recursion using strings, Recursion using 2D arrays
	Time and space complexity	Order complexity analysis, Theoretical complexityanalysis, Time complexity analysis of searchingandrecursive algorithms, Theoretical space complexity, Spacecomplexity analysis of merge sort

Introduction to Data Structures

Topics	Sub-topics	Details
Object-oriented programming	Basics of OOP	Introduction to oops, Creating objects, Getters, andsetters, Constructors and related concepts, Inbuilt constructor and destructor, Example classes
	Advance concepts OOP	Static members, Function overloading and relatedconcepts,Abstraction, Encapsulation, Inheritance, Polymorphism, Virtual functions, Abstract classes, Exceptionhandling
Linear DataStructuresv	Linked lists	Introduction to linked list, Inserting node in linkedlist, Deletingnode from linked list, Midpoint of linked list, Merge two sorted linked lists, merge sort of a linked list, Reversing a linkedlist
	Stacks and Queues	Introduction to stacks, Stack using arrays, Dynamic Stackclass,Stackusing linked list, Inbuilt stack, Queue using arrays, Dynamic queueclass, Queue using linked list, Inbuilt queue
Trees	Generic Trees	Introduction to Trees, Making a tree node class, Taking a tree as input and printing, Tree traversals, Destruct or for tree node class
	Binary Trees	Introduction to BinaryTrees,Taking a binary tree as input andprinting, Binary Tree traversals, Diameter of binary tree
	Binary Search Trees	Introduction to Binary Search Trees, Searching a node in BST,BST class, Inserting and Deleting nodes in BST, Types of balanced BSTs
Advanced Data Structures	Priority Queues	Introduction to Priority Queues, Ways to implement priority queues, Introduction to heaps, Introduction to Complete Binary Trees and its implementation, Insert and Delete operations in heaps, Implementing priority queues, Heap sort, Inbuilt Priority Queue
	Hashmaps	Introduction to Hashmaps, Inbuilt Hashmap, Hashfunctions,Collision handling, Insert and Delete operation implementation in hashmap, Load factor, Rehashing
	Tries	Introduction to Tries, Making a Trie Node class, Insert, Search and Remove operation implementation inTries, Types of Tries, HuGman Coding

Introduction to Data Structures

Topics	Sub-topics	Details
Advanced Data Structures	Graphs	Introduction to Graphs, Graph Terminology, Graph implementation,Graph Traversals (DFS and BFS),Weighted and Directed Graphs, Minimum Spanning Trees, Cycle Detection in Graphs, Kruskal's algorithm, Prim'sAlgorithm, Dijkstra's algorithm
Dynamic Programming	Introduction to Dynamic Programming	Introduction to Graphs, Graph Terminology, Graph implementation,Graph Traversals (DFS and BFS),Weighted and Directed Graphs, Minimum Spanning Trees, Cycle Detection in Graphs, Kruskal's algorithm, Prim'sAlgorithm, Dijkstra's algorithm
	Applications of Dynamic	Longest Common Subsequence (LCS) using recursion, memoizationand dynamic programming, Edit distance using recursion, memoization and dynamic programming, Knapsack problemusingrecursion, memoization and dynamic programming

Frontend Module

Topics	Sub-topics	Details
Getting started with Basics	History of Web	Understanding how and who built the web
	Client server architecture	General architecture used by websites
	What happens when you visit a	Learning what happens behind the scenes while openingawebsite
Introduction to HTML	HTML structure	How to create the structure of a web page
	Tags in HTML	Learning about various tags in HTML like <a>, etc
More on HTML	More tags	Practice creating HTML with more tags
	Block v/s Inline elements	Understand the diGerence between inline and block HTML elements
	Table	Learn to create tables in HTML
Forms	Form	How to create the structure of a web page
	Form fields	What is an HTML form
Intro to CSS	CSS Introduction	What is CSS and how to use it in HTML
	Blog page	Building and styling the blog project
Starting with Resume project	Starting the project	Start building the Resume project by creating the HTMLstructure

Frontend Module

Topics	Sub-topics	Details
Flex	Intro to Flex	Introducing SASS, setting up SASS for our project
	Flex properties	Explaining 1:1,1:M and M:M DB relations
	Using flex in Resume	Utilising flex to style the Resume project
Responsive designs	Media queries	Learning storage in SQL databases
Completing Resume	Pseudo elements	What are pseudo elements and where to use them
	Finishing up	Finish building the Resume project
Animations and 3D space	Animation properties	Basics of CSS animation and how to animate HTML elements using animate.css
Bootstrap	Frontend frameworks	What are frontend frameworks and how to use one
	Grid system	Learning about grid system of bootstrap
	Bootstrap components	Using various other bootstrap elements like Navbar, Jumbotron etc
Major Project	Assignment	Build a music player project with your newly gained skill set
Starting with Javascript	Intro to JS	What is JS and history of JS
	Variables, operators, loops	Learning the basics of the language

Frontend Module

Topics	Sub-topics	Details
JavaScript: Functions and Arrays	Scope	Understanding scope in JS
	Hoisting	What is hoisting and its application
	Functions expressions v/s Function declaration	DiGerence between function expression and declaration
	Arrays and its usage	What are arrays and using array functions like splice, slice etc.
Objects and Timing Events	Intro to Objects	What are objects, how to create them and using diGerent notations to access object's data
	Object functions	Learn to iterate over objects, delete object properties, creating nested objects
Understanding DOM	DOM	Understanding DOM, what it is, how to access elements from the DOM
	Events	How to manipulate DOM events in JS
Calculator Project	Assignment	Creating a mini calculator with basic functionality
Mini Projects Using Javascript	let v/s var	Learning diGerent ways to create variable
	Catch me if you can	Build a game using vanilla Javascript
Closures	Revision	Revising some old concepts like Scope, window object etc
	IIFE	What are immediately invoked function expressions
	Closures	What are closures and its application

Frontend Module

Topics	Sub-topics	Details
Closures	Arrow functions	How does the "this" keyword works in JS
Constructors and Prototypes	"this" keyword	How does the "this" keyword works in JS
	Prototypes	Discussing what are prototypes in JS, why do we use them and its application
	Class	Learning about using classes in JS and how to deal withclass inheritance in JS
Project: Ping Pong Game	Assignment	Building the famous ping pong game with Javascript
Ashyncronous JavaScript	Promises, Callback	What are promises and callbacks in Javascript, Whytouse
	Timed Events	What is setTimeout, Event loops in javascript
	Async Await	What are Async Await in Javascript, Why that is important
TODO list	SPA, MPA	Single page appplication and multiple page application
	API	How to use API in Javascript
	IIFE module design pattern	
jQuery	Intro to jQuery	What is jQuery and what is the need for it
	Event handling in jQuery	Handling various JS events with jQuery and exploring the library

Frontend Module

Topics	Sub-topics	Details
Ajax	Intro to AJAX	What are async requests, what is API and JSON
	Ajax requests with jQuery	Making ajax requests with jQuery and handlingerrors
Promises	Intro to promises	What is a promise, how do we use promises and chaining promises
Git	Intro to Git	What is git and why it's helpful
	Branches	Exploring branches in Git. How to create branches.
	Git workflow	Understanding push, commits, pull requests and using git for teams and individual

Backend Module

Topics	Sub-topics	Details
Node.js : The Beginning	Intro to Node Setting up Intro	Introduction to the course, hello world with nodejs
	to servers	Setting up tools and the project
Node.js : Writing Our First Server	Setting up node server nodemon	What are servers and how one can use them
		Beginning the project by setting up the very first nodeserver
		Introducing nodemon to monitor changes made totheserver
My First Express App : A List of contacts	MVC	MVC architecture for our server
	Express	What are frameworks, using express with node
	Ejs	What are template engines, setting up and working with Ejs
My First Express App : Continued	Creating the contact list	Building the contact list, sending data to server, parsing the data
	Middleware	Using query parameters in our app for deletingcontact
	Query parameters	What is a middle ware and how to use one
My First Express App : Intro To Databases	Intro to Databases	What are databases, SQL and No SQL databases
	MongoDB	What is MongoDB, how to use it and setting up MongoDBfortheproject
	DB operations	CRUD operations for MongoDB

Backend Module

Topics	Sub-topics	Details
Beginning The Major Project 1	Directory structure and setup	Setting up the MVC directory structure, router and ejs setup
	Controllers	Creating controllers and router for handling incoming requests to the server
Major Project - 1	Assignment	Build a Todo list app using Nodejs and MongoDB
Beginning the Major Project - 2	Partials, Layouts	Understanding and creating Partials and layouts in views
	Static files	Setting up static file access
	Mongoose	Linking MongoDB using Mongoose
Authentication Using Passport js	Intro to passportjs	What is passportjs, setting up passportjs for the project
	MongoStore setup	Setting up MongoStore for session cookies
Manual Authentication	User schema	Setting up user schema for out app
	Cookies	What are cookies and how to use themin theapp
	User sign up and sign in	Build user sign in and sign up flow and learn howtoauthenticateusers manually
SASS	Intro to SASS	Introducing SASS, setting up SASS for our project
Database Relations (Posts, Comments)	DB relations	Explaining 1:1,1:M and M:M DB relations
	Relationship for Post and Comments	Understanding the relationship between Post and Comments, creating schemas for both

Backend Module

Topics	Sub-topics	Details
Database Relations (Posts, Comments)	SQL storage	Learning storage in SQL databases
Deleting and Updating Objects in Database + Distributing Views	Deleting Posts/ Comments/Users	Understanding how deletion works with Posts and Comments
	User profile	Working on user profile and updating SCSS for other pages
Async Await + Error Handling	Async await	What is async await and converting our code to async await
	Flash messages	How to create flash messages, using Noty to show flash messages
Converting to AJAX	Using AJAX	Learn how to use AJAX for post creation, deleting post etc
File upload	Intro to file upload	Learning how to handle file uploads
	Multer	Using multer to handle profile picture upload in the project
Social Authentication (Mini Lecture)	Social auth with Google	What is social authentication and how does it actually works
	Using passport for Google auth	Setting up passport for google social auth
APIs (making APIs and JWT authentication)	Intro to APIs	What are APIs and why do we use them
	JWT	Understand what is JWT, how does authentication and authorization works, build some APIs for the same

Backend Module

Topics	Sub-topics	Details
Parallel Jobs + Mailer	Nodemailer	Intro to mailers, setting up Nodemailer for sending emails
	Sending mails	Learn how to setup and send emails for your project
	Delayed jobs	Understand what are delayed jobs and how they can be helpful using the Kue library
Friends + Likes	Polymorphic relation	Intro to a new DB relationship i.e. Polymorphic relations
	Making friends	Using Polymorphic relationship to create add a friend functionality
Chatting Entgine	Sockets	What are sockets and how to use them
	Socket.io	Setting up Socket.io and using it to send messages
Gulp ::Getting deployment ready	Introduction to production environments	Learn how to create a production environment for the project using environment variables
	Gulp	What is gulp, using gulp to automate certaintasks
Deployment	AWS	Learning how to deploy apps on AWS, SSH to set uptheserver, understand and setup Nginx
Major Project	Assignment	Build the major project
React	All about React	Intro to React and building basic components

React Module

Topics	Sub-topics	Details
Intro to React	SPAs v/ s MPAs	DiGerence between Single page apps and Multi page apps
	React philosophy	What is React's philosophy?
	React v/s others	Why React stands out from other JS libraries and frameworks.
	All About React	Intro to React and Building basic components
Vue	All about Vue	Intro to React and building basic components
Hello World	Using React Babel	Ways to start using React in a project
	Conditional rendering	Using babel and understanding how it works withReac
	Introduction to the project Adding	Rendering diGerent components based on diGerent conditions
Mini Project: Starting the project	CSS	Introduction to Cart and its working
	Using state	Styling the cart using CSS
	More on React state	Adding state to Cart
Mini Project: Managing state	Rendering lists	React state in depth

React Module

Topics	Sub-topics	Details
Mini Project: Finishing up	Props	How to render list of items
	Delete, adding Navbar, total products count	What are props and how do we work with them
	Introduction to Firebase	Building more functionalities of cart
Firebase: Mini project extended I	Component lifecycle	Understanding what is firebase and how it actually works
	Firebase setup CRUD with	Learning about lifecycle of a React component
	Firebase	Setting up firebase and adding it to the project
Firebase: Mini project extended II	Querying data	Learning how to create, read, update and delete datafrom firebase
		Querying data from firebase
Mini project		Assignment project, building a vintage iPod
Major Project: User profile	Settings page, editing a user, add user as a friend	Building various functionalities of the social media app
Intro to Redux	All about Redux	What is redux, why and when do we use it
	Setting up the project	Setting up the Movie search project
	Adding U	Start adding components to the project

React Module

Topics	Sub-topics	Details
Redux: Actions, Reducers, Store	Reducers	What are reducers and creating reducers for the app
	Actions	What are actions, dispatching actions, creating actions for the app
	Store	What is store, subscribing to the store and adding store to the project
Redux continued	Currying	Understanding the currying
	Combining Reducers	How to combine reducers to make the app more eGicient
	Middleware	Learning about middlewares and using some with Redux
	Thunk	Using thunk to make async calls to an API
Major Project: Search and Chat	Searching users	Adding functionality to search users
	Building the chat box	Creating the chat using sockets
React Hooks	Use EGect, use State and other	What are hooks, why do we use them and various React hooks out there
React and Redux	Context API	What is the context API and how to use it
	HOC	Learning about Higher order components inReact
	connect() with Redux	Diving deep into how connect() works in Redux and using react and redux together

React Module

Topics	Sub-topics	Details
Major Project: Setup and Intro	Project setup	Setting up the social media project
	PropTypes	Using PropTypes for props validation
Major Project: Routing and Auth	React router	Adding react router to the project to handle diGerent routes
	Auth in SPA	Understanding how auth works for SPAs
	Form handling	Ways to handle form in React
	User login	Building the user login functionality

Interview Preparation - Aptitude

Lecture	Topic Name	Description
NUMBERS	Introduction to Number System	Number System, Remainder theorem, Unit Digit
	Progressions	Arithmetic progression, Geometric progression
	HCF and LCM	Finding factors of a number, Shortcuts for finding primenumber,Concept of HCF, Problem Solving on HCF,Concept of LCM, ProblemSolving on LCM
AVERAGES AND MIXTURES	Averages	Introduction to Averages, Assumed average approach, StandardSituation in Averages, Concept of Weighted Averages, Standard Situations involving weighted average
	Alligations	Introduction to alligations, Standard problems involvingusing
ARITHMETIC AND WORD PROBLEMS	Percentages	Concept of percentages, Concept of percentage change, Percentage Change Graphic, PCGappliedtoProductchange, PCG Applied to Product Constancy, Product Constancy Table, The fractional view to the product constancy table, PCG applied to successive percentagechange
	Ratio, Proportion and Variation	Concept of Ratios, Multiplierlogic, Concept of proportionVariation and its types
	Profit and loss	Basic concept of Profit and loss, Concept of Simple Interest, Concept of Compound Interest
	Time and Work	Introduction to Time and Work, Time and work (Man Days), Men, Women and Children
COUNTING	Probability	Basicsof Probability, Problemson Coins, Problems Based on Dice, Problems Based on Cards, Problems Basedon Balls from the Box,Word Based problems on Probability
	Permutation and Combination	Introduction to Permutation and Combination, The selection Formula, Distribution of Identical Objects, Formula for Arrangements, Circular arrangement

Interview Preparation - Aptitude

Lecture	Topic Name	Description
TIME, SPEED AND DISTANCE	Introduction to Time, Speed and Distance	Introduction to Time, Speed, Distance The proportionalities in equations. Solving problems on TSD
	Relative Speed	The concept of Relative Speed. Questions based on Relative Speed
	Application of TSD	Concept of Circular Motion, Train problems Boats and Stream problems, Races and Games
REASONING	Recognising Patterns	Recognising alphabetical patterns, Recognising numerical patterns, Coding Decoding Question Patterns
	Syllogisms	Introduction to Syllogisms, Problems on Syllogisms
	Blood relation and calendars	Solving problems on Blood Relations, Concept of Calendar, Problems on Calendar
ENGLISH	Reading Comprehension	Reading eGectively reading compre-hension, How to find mainidea, Solving reading comprehension
	Sentence completion/ Fill ups	Theory of Fill Ups/ sentence completion, Questions on sentence completion
	Vocab, Antonym and Synonyms	Introduction to English, Vocab, Antonym and Synonyms
DATA INTERPRETATION	Basic Concepts of Data interpretation	Introduction to Data interpretation, Problems on Data interpretation
	Charts	Reading Pie charts, Reading Bar Charts, Reading tables and X-Y Charts, Problems on Charts

Introduction to Operating System

Introduction to OS	Detailed Definition of OS
	Components of OS: User Space and Kernel Space
	Demonstration on functionalities of Kernel
	Types of Kernel
	Introduction to terminal in Linux OS
	System Calls
Process Management	Process and Process Control block
	Architecture of Process with Basics of Storage Devices
	Process States
	Operations on Processes
	Special types of Process: Orphan and Zombie Process
	Process Scheduling
	Process Scheduling Algorithms: FCFS, Shortest Job First, Priority Scheduling, Round Robin, Multilevel Queue and Multilevel Feedback Queue Scheduling

Introduction to Operating System

Memory Management	Memory Management in Early Systems
	Improvement and Challenge of Isolation and Protection
	Understanding Stack and Heap Memory
	Initial attempts on Virtualisation of Memory and Address Translation
	Free Space Management
	Memory Allocation Techniques: Fixed Partitioning
	Dynamic Partitioning, Segmentation, Paging, Paging with Translation Lookaside BuGer
	Virtual Memory and Page Faults
	Page Replacement Algorithms
	Thread Scheduling Issues
	Solution to Synchronisations Issues: Locks, Conditional Variables and Semaphores
Concurrency	Processes, Threads and Multithreading
	Thread Scheduling Issues

Introduction to Operating System

Concurrency	Solution to Synchronisations Issues: Locks, Conditional Variables and Semaphores
	Concurrency Bug: Deadlock
	Deadlock Avoidance and Prevention Banker's Algorithm
	Need for Secondary Memory
Storage Management	HDD and SSD
	File System, Files and Directories
	Disk Space Allocation Methods: Contiguous, Linked and Indexed
	Disk Scheduling Algorithms: FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK
Case Study: LinuxOS	Introduction to Linux OS
	Process Management, Memory Management and File System in Linux
	Linux Cgroups and Namespaces
	Linux Boot Process
	User Management

Case Study: LinuxOS	Package and Repository Management
	Jobs and Crontab
	Troubleshooting in Linux
	Debuggability using Logs

Introduction to DBMS

Lecture Name	Description
Introduction to DBMS	What is Data, What is information, What is database, Before the arrival of databases , What is database management systems
Data Modeling	Introduction to Data Models, Types of Data Models, Database Architecture, Three- Schema Architecture, Data Independence and its types
Entity-Relationship Model	Introduction to ER Models, Components of ER Diagrams, Entity, Attributes , Relationship and their types, Creating an ERDiagram
Relational Model	Relational Model Concepts, Properties of a table, Database keys, Integrity rules and constraints, Relational Algebra
SQL	Introduction to SQL, SQL commands such as Data Definition Language (DDL), Data Query Language (DQL), Data Manipulation Language (DML), Data control language (DCL), Transaction Control Language (TCL), Creating Database and Tables, Fundamental Queries, Aggregate functions, Joins, Subqueries, Set Operations, Stored Procedures, Triggers
Normalization	Functional dependencies, Anomalies : insert, update, delete, Normalisation,Types of normal forms- INF, 2NF, 3NF, BCNF.
Transactions	What are Transactions?, ACID properties: Atomicity, Consistency, Isolation, Durability, State of transactions
Indexing	Indexing in DBMS, Indexing Methods, Primary index, Ordered index: Dense and Sparse index, Clustering index, Secondary index

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Introduction to DBMS

Lecture Name	Description
Classification of Databases	Introduction to diGerent types of databases, Relational database, Object-oriented database, Network database, Hierarchical database
NoSQL Databases	Introduction to NoSQL databases, Why are NoSQL Databases needed, Features of NoSQL databases, Types of NoSQL databases; Key-value Pair Based, Column-oriented Graph, Graphs based, Document-oriented
Database optimization	Concurrency Control, Partitioning, Clustering, Sharding

Introduction to System Design

Lecture Name	Description
Introduction	Covers the introduction of System design, low level and high level designs, product cycle, and why system design is important.
Architectural patterns	Covers diGerent architectural patterns such as centralized and distributed, when to choose which pattern, their advantages and disadvantages, how to scale an application ,types of scaling.
Application characteristics I	Covers concepts such as latency, throughput, redundancy, replication, availability and fault tolerance with industry relevant examples.
Application characteristics II	Covers concepts such as consistency, types of consistency, CAP theorem, logical time in distributed systems and Lamport algorithm with industry relevant examples.
Application characteristics III	Covers concepts such as load balancers, load balancing algorithms, caching, types of caching solution, cache eviction strategies with industry relevant examples.
Database	Covers databases, types of databases, polyglot, indexing, denormalization,
Database Optimization	Covers database optimization concepts like partitioning, types of partitioning, sharding, diGerent partitioning criteria with industry relevant examples.

Introduction to System Design

Lecture Name	Description
Communication	Covers topics such as synchronous and asynchronous communication, message based communication
Web Applications	Covers web applications, client server model, RESTAPI, service oriented architecture (SOA), microservices, tier architecture
Servers and security	Covers web servers, communication protocols, push and pull model, long polling, web sockets, server sent events, proxies, authentication, authorization protocols
Real Life Use Cases	Covers step-by-step approach to design popular applications.
Distributed web crawler	Detailed step by step process and explanation on how to design Distributed web crawler
Global chat service : Messenger	Detailed step by step process and explanation on how to design a global chat service.
Video streaming service (Youtube)	Detailed step by step process and explanation on how to design a video streaming service.
File storage and sharing system(Dropbox)	Detailed step by step process and explanation on how to design a file storage and sharing system

Introduction to System Design

Lecture Name	Description
Global ride sharing system(Uber)	Detailed step by step process and explanation on how to design a global ride sharing system
Practice projects	Covers practice projects for the learners with their solutions.
Mock interview sessions	Covers what to expect in a System design interview, important interview questions, how to ace them, questions to ask before you start working on a given system,pointers to remember while designing a system.