

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
	Conditional statements	Introduction to If else, Relational and logical operators, Nested conditionals
	While loop	While loops, Flow of execution of statements in while loop, Example problems using while loop
Loops and Functions	Patterns	Introduction to patterns, Basic Patterns, Square Patterns, Triangular Patterns, Character Patterns, Reverse Triangle, Inverted patterns, Isosceles triangles
	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 inbuilt functions
	2D Arrays	2D arrays, Storage of 2D arrays, Example problems using 2D Arrays

Introduction to Data Structures

Topics	Sub-topics	Details
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 complexity analysis, Time complexity analysis of searching and recursive algorithms, Theoretical space complexity, Space complexity analysis of merge sort
Object-oriented programming	Backtracking	Introduction to backtracking, Problems based on backtracking: Rat in the maze, Word search, and N-Queens
	Basics of OOP	Introduction to oops, Creating objects, Getters, and setters, Constructors and related concepts, Inbuilt constructor and destructor, Example classes
Linear Data Structures	Advance concepts of OOP	Static members, Function overloading and related concepts, Abstraction, Encapsulation, Inheritance, Polymorphism, Virtual functions, Abstract classes, Exception handling
	Linked lists	Introduction to linked list, Inserting node in linked list, Deleting node from linked list, Midpoint of linked list, Merge two sorted linked lists, merge sort of a linked list, Reversing a linked list
Trees	Stacks and Queues	Introduction to stacks, Stack using arrays, Dynamic Stack class, Stack using linked list, Inbuilt stack, Queue using arrays, Dynamic queue class, Queue using linked list, Inbuilt queue
	Generic Trees	Introduction to Trees, Making a tree node class, Taking a tree as input and printing, Tree traversals, Destructor for tree node class
Advanced Data Structures	Binary Trees	Introduction to Binary Trees, Taking a binary tree as input and printing, 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
Priority Queues	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

Topics	Sub-topics	Details
Dynamic Programming	Hashmaps	Introduction to Hashmaps, Inbuilt Hashmap, Hash functions, Collision handling, Insert and Delete operation implementation in hashmap, Load factor, Rehashing
	Tries & Huffman Coding	Introduction to Tries, Making a Trie Node class, Insert, Search and Remove operation implementation in Tries, Types of Tries, Huffman Coding
	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's Algorithm, Dijkstra's algorithm
	Introduction to Dynamic Programming	Introduction to Memoization, Introduction to Dynamic Programming, Fibonacci numbers using recursion, memoization and dynamic programming
	Applications of Dynamic programming	Longest Common Subsequence (LCS) using recursion, memoization and dynamic programming, Edit distance using recursion, memoization and dynamic programming, Knapsack problem using recursion, 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 website	Learning what happens behind the scenes while opening a website
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 tags	Practice creating HTML with more tags
More on HTML	Block v/s Inline elements	Understand the difference between inline and block HTML elements
	Table	Learn to create tables in HTML
	Form	How to create the structure of a web page
Forms	Form fields	What is an HTML form
	CSS Introduction	What is CSS and how to use it in HTML
	Blog page	Building and styling the blog project
Intro to CSS		

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

Topics	Sub-topics	Details
Getting started with JavaScript	Intro and History of JS (ECMA) First JavaScript Code Various IDEs available	What is JS and history of JS Various IDES available.
Fundamentals of JS	Variables, Data Types Operators & Conditional Statements loops	Learning the basics of the language Working with operators and conditional statements Working with various loops
Loops, Arrays, Function & Objects	Functions expressions v/s Function declaration. Arrays and its usage and Intro to Objects Execution Context, Hoisting, Call Stack Scope	Difference between a function expression and declaration What are arrays and using array functions like splice, slice, etc. Introduction to objects in JS. Learning the internal working of the language. Understanding scope in JS
Working of JS	Closures JS Runtime Environment Arrow, IIFE, Pure/ Impure	What are closures and its application Introduction to JRE and its components. Different types of functions
Functions in JS	Callback Functions Higher Order Functions	What are Callback functions, and when they are used What are Higher Order Functions and its application

Topics	Sub-topics	Details
Functions in JS	Map, reduce, and filter	Working of map() reduce() and filter() functions
OOP in JS	Object, Constructor Function Prototype Destructuring	Understanding creation and access of objects, 'this' keyword, Constructor function, and its usage Understanding Prototype and its chain in objects and Array Learning Object and Array destructuring
ES6 Classes	Class in JS Encapsulation, Inheritance Built-In classes in JS, JSON, Shallow, and Deep copy	Understanding classes and its usage What is Encapsulation and Inheritance Learning built-in JS classes, introduction to JSON and Copy in JS
DOM Manipulation	API, DOM DOM Selectors Event Listeners and Event Propagation	What is DOM, and how to access it? Different types of selectors Creating and removing Events and different event listeners available
Mini-Project: Quiz Game	Assignment Shuffle Options, Using JSON	Project setup, Displaying question and correct option Working for the completion of Project
JS ASYNCHRONOUS	Callback, Promises Async Await	What are promises and callbacks in Javascript, Why to use What are Async-Await in Javascript, Why that is important.
Modules in js	What are modules? Import/Export	Introduction to Modules. Named and default Import/Export

Topics

Sub-topics

Details

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

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



Backened Module with Spring Boot

Topics	Sub-topics	Details
Introduction to Spring Boot	What is Spring Boot, and why is it used? Inversion of Control	Introduction to Spring Boot as a tool to develop web applications. Understanding IOC as a fundamental Spring Framework, Bean and Spring Container principle.
Dependency Injection	What is Dependency Injection? Types of Dependency Injections Understanding Bean and Bean Scope	Overview of the dependency Injection as a fundamental principle of Spring Constructor Injection, Setter Injection Overview of Bean and Bean Scope as a fundamental principle in Spring.
Bean Scope and Life Cycle	Types of Bean Scopes Understanding the life cycle of a Bean Life Cycle Hooks	Singleton and Prototype Explore the Life cycle as the process of creating, initialising, and destroying a bean. Explore the Init Method and Destroy Method
Spring Annotations	What is Annotation? Spring fundamental principle using Annotations @SpringBootApplication annotation YAML	Overview of Annotation and its Use in Simplifying Application Development. Explore @Component, @Autowire, @Scope, @Qualifier, @PostConstruct, @PreDestroy Simplify the setup of a Spring application. Configuring and Customising the Spring Application using YAML

Topics	Sub-topics	Details
MVC Core Principles	Understanding MVC and its architecture	Overview of Model-View-Controller and its architecture when developing Spring Boot Application.
	Creating Controllers in Spring MVC	Overview of Controller and Web Layer, @Controller, @RequestMapping and @Model Attribute, Creating a Demo Project: Student Registration.
	Creating Views in Spring MVC Application	Creating Welcome and Registration Page using JSP, Spring MVC Form Handling
	Understanding different Layers	Web Layer, Service Layer, Domain Layer, Repository Layers
	Validating Objects in Spring MVC Applications	Java Optional, Generic type, HashMap, ArrayList
MVC and Web	What is Query Param?	Passing Query from URL, Creating support Page for the Registration form, JSP Taglib directive
	ModelMap, ModelandView	Route the pages using Model and View
	Understanding Path Param	Extract variable values from the URL path, @PathVariable annotation, and Creating Instructors page.
	Web Service	Overview of web services, the architecture of web services, API vs Web Services
Rest API: Get and Post	Restful Web services	Understanding REST, REST vs SOAP, type of Restful API, @RestController, @RequestMapping, @ResponseBody
	Creating Get Request	Demo Project: Hotel Booking Application, creating APIs to fetch details, HashMapping, ArrayList.
	Creating Post Request	Demo Project: Hotel Booking Application, creating APIs to add new objects and items
	Postman	Testing APIs on Postman

Topics	Sub-topics	Details
Rest API: Put and Delete	Creating Put Request	Creating APIs to update objects in Hotel Application, Testing APIs on Postman
	Creating Delete Request	Creating APIs to delete objects in Hotel Testing APIs on Postman
Project	Validations for Restful Services	Validating APIs using Validation Annotation: @min, @max, @size
	Movie Booking Application	Building a Mini Project using Restful Web Services in Spring Boot.
REST Template	Understanding REST Template	Overview of REST Template, consuming third party APIs, Inter-Service Communication
	Rating Service	Setting up demo third Party Service
Hibernate and CRUD Operation	Inter Service Communication using HTTP Protocols	GET Request , POST Request, Put Request.
	Error Handling and MessageConverters	Delete Request.
@Transaction and @Session	ORM framework	Hibernate, JDBC, understanding the ORM frameworks, MySQL Configuration, Relational Database
	Demo Project	Entity Manager, Persistence of Object, @Entity, @Transaction and @Session
CRUD Operation Related to Database	Creating a demo CNkart Application	Creating a demo CNkart Application
	REST API, Error Handling	REST API, Error Handling

Topics	Sub-topics	Details
Hibernate and Relationships	Understanding Relationship	Introduction to Relationship within Entities
	Types of Relationships	One to One, One to Many, Many to Many
	H2 Database	Configuring H2 databases
Project	Expense Manager	Building a Mini Project using Restful Web Services, Hibernate and Relationships
	Spring Data JPA	Introduction to Spring Data JPA, Spring Data JPA vs Spring Data
	Spring Data Interfaces	Repository, CrudRepository, PagingAndSortingRepository, JpaRepository
Spring Data JPA	APIs & CRUD Repository	REST API, Persistence of Object using Spring Data JPA
	Understanding the query In Java	Need of writing query in Java Types of query, Derived Query, JPQL, Named Query
	Creating Custom Query	JPQL, Named Query, NamedNative Query, Native Query
Spring Data JPA and Queries	E-voting Application	Building a Mini Project using Restful Web Services, Spring Data JPA, JPQL and Named Query
	Introduction to Spring Security	Security in web applications, Basic concepts of authentication and authorization, Overview of Spring Security framework and its features
	Configuring Spring Security	Basic configuration of Spring Security, Configuring authentication providers, URL-based security
Introduction to Spring Security		

Topics	Sub-topics	Details
User Authentication and Authorization	User Authentication User Authorization	Authentication mechanisms, Implementing form-based authentication Roles and permissions Authorization, Method-level security, Customizing error pages
Password Security and Session Management	Password Encoding Session Management	Understanding Password encoding algorithm, Storing and retrieving hashed passwords "Remember Me" functionality, Managing user sessions, Clearing session data
Spring Security Advanced Topics	CSRF and XSS Advanced Topics in Spring Security	Overview of the CSRF (Cross-Site Request Forgery) and XSS (Cross-Site Scripting), Protection mechanisms in Spring Security Custom authentication providers, securing RESTful APIs, token-based authentication using JWT
Project	Secure Online Banking Application	Building a Mini Project using Restful Web Services, Spring Data JPA, and Spring Security
Spring Boot Actuator and Dev Tools	Actuator and Dev Tools	Overview of Spring Boot - Dev tools, Spring Actuator an Overview, How to access Actuator Endpoints
Logging and Metrics	Logging and Metrics in Spring Boot	Introduction to logging in spring-boot, Logging configurations, Collecting logs, Adding Health checks and metrics
Junits Testing	Introduction to testing and Junit Junit annotations Mocking data bases	Overview of testing and Junit, Building first JUnit test Exploring assert methods Overview of Mockito, Mockito annotations implementations

Topics	Sub-topics	Details
Microservice	Monolithic vs Microservice	Introduction to microservices, Difference between Monolithic and Microservice architecture
	Principle and advantages of Microservice	Key Microservice Principles, Advantages of Microservice
	Creating Demo Microservice Project	Designing a Microservice based Project, Rest API, Eureka, Hystrix, Feign Client, API gateways
Capstone Project	Ecommerce Application	Building an end to end Ecommerce Project in Spring Boot using Rest API, Spring Data, Microservice architecture and Security.

React Module

Topics	Sub-topics	Details
Introduction to React	What is React?	Features of React
	SPAs vs MPAs	Difference between Single page and Multi page applications
	How React Works	How Virtual DOM and Babel are working under the hood?
	Creating First React Element	VS Code Basics, What is JSX?
	React Component	Functional Component, React Fragments, React dev tools
Learning JSX	JSX Expressions	Rendering Javascript inside JSX (Variables, data types, functions)
	Rendering Arrays and Objects	How to render list of items from an array (using map function) and objects rendering in React
	Conditional Rendering	Conditional rendering using Ternary, AND and OR operators
Score-Keeper App	Event Handling	How to handle events in JSX?
	Forms in JSX	How to take input and display form data in JSX?
	Accessing Input Values	Using refs to access React elements

Topics	Sub-topics	Details
Create-React-App	CDNs and Webpack	Drawbacks of CDNs, Using Module Bundler in React Project
	Tools Installation	Installing required tools for creating a React Project
	Folder Structure	Understanding the folder and files structure
	Import/Export	How to import and export components in files?
React Components - I	Class Based Components	How to create class based components?
	Movie-App Project	Creating and adding functionalities to Movie App
	State in React	Adding state to components
React Components - II	Props	What are props, passing data through props from one component to another, Default props
	Drawbacks of global scope of styling file (CSS)	Understanding CSS Scope to avoid colashes in classNames
	Limiting the scope of styling using inLine styling	Creating inline styles for the elements, styling objects in the component.
Styling in React	Styled Components	Writing styled components to limit the scope of styling
	Dynamic Styling	Styling Application based on a condition using styled-components
	CSS Modules	Modern styling techniques used by developers

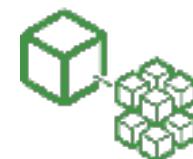
Topics	Sub-topics	Details
Component Lifecycle Methods	Component Lifecycle	Different Phases of Component lifecycle like mounting, unmounting, etc.
	Mounting Phase	Lifecycle methods involved during execution and their order
	Side Effects	How and where to perform side effects
	Updating Phase	Methods involved in the updating phase
	Un-mounting Phase	Performing clean-ups during un-mounting
	Error-handling	Creating Error-Boundary
React Hooks	Use Effect, use State and other hooks	What are hooks, why do we use them and various React hooks out there
Firebase 9	Introduction to Firebase	Understanding what is firebase and how it actually works
	Firebase Setup	Setting up firebase and adding it to the project
	CRUD with Firebase	Learning how to create, read, update and delete data from firebase
React Router v6	Querying Data	Querying data from firebase
	Routing	Building navigation and showing different pages for different routes.

Topics	Sub-topics	Details
Context API	Context API	Passing Arguments to the component tree without passing props at every level
Redux in React	What is Redux? Store, Action, Reducers Thunk Middleware	Why Redux is used? What is the Data Flow? Fundamental Principles of Redux, applying them practically Allows you to write action creators that return a function instead of an action.
Redux Toolkit	Redux Toolkit	Set of tools that helps simplify Redux development

Course Offerings

- Introduction To Programming
- Data structures and algorithms
- Frontend Module
- Backend Module with Spring Boot
- React Module

Tools & Technologies



Redux



JUnit



Projects



Music Player

Build and style a music player like Spotify/Youtube Music using HTML and CSS



Stock Market Analysis

A project which allows users to add different stocks to their portfolio and get real-time data on their stocks using API, which automatically updates after a few sec.



iPod

Build a clone of iPod nano 5th gen



PhotoFolio

An online photo album app that allows users to upload, organise, and share their digital photos.



BusyBuy

A web-based application that allows users to browse and purchase products online



Movie Booking Application

Building a Mini Project using Restful Web Services in Spring Boot.



Expense Manager

Building a Mini Project using Restful Web Services, Hibernate and Relationships



E-voting Application

Building a Mini Project using Restful Web Services, Spring Data JPA, JPQL and Named Query



Secure Online Banking Application

Building a Mini Project using Restful Web Services, Spring Data JPA, and Spring Security



Ecommerce Application

Building an end to end Ecommerce Project in Spring Boot using Rest API, Spring Data, Microservice architecture and Security

