

Building MicroServices in Java for Cloud



Milestone	Module	Lecture Title
Java Concept revision	Data Types, Casting, Keywords	Java Identifiers
		Java DataTypes
		Java Reserve words
		TypeCasting in primitive types
	Operator, Array, String	Working with Operators
		Working with flow control statements
		Working with Arrays
		Working with String,StringBuilder,StringBuffer
	JVM, Variables	JVM Area and its Architecture
		Types of variables and its scope
		var-args in java
		new vs newInstance(), instanceof vs instanceof()
	Exception, imports, modifiers	ClassNotFoundException vs NoClassDefFoundError
		Exception handling
		java file strucutre,different types of import
		packages and its modifiers
	OOPS and MultiThreading	Introduction to oops
		Inheritance in java
		Method Overloading and Method Overriding
		Abstract class vs interface
	Collection and JDBC	MultiThreading
		Collections
	Servlet and JSP	Usage of JDBC API
		Usage of Servlet to build webapplication
		Usage of JSP to design view for webapplication
		Introduction to Frameworks
		Programming language

Frameworks	Need of Framework and How Spring fits into Enterprise world	Technology
		Framework
		Java Bean (VO /DTO/BO classes)
		Component class vs java bean vs spring Bean
		POJI vs POJO
		Introduction to Spring
		What is Spring
		How Spring fits into the Enterprise world
		Strategy Design Pattern
		Types of IOC
		Constructor VS Setter Injection vs Field Injection
	SpringCore Basics	Collection Dependency Injection
		Bean Alias
		Bean Scopes
		Bean Autowiring
		Nested Bean Factories
		Using P & C Namespace
		Depends-On
		Bean Lifecycle
		Aware Interfaces
		Static Factory Method Instantiation
		Instance Factory Method Instantiation
		Factory Beans
		Method Replacement
		Lookup Method Injection
		SPRING CORE ANNOTATION SUPPORT
		@Configuration
		@Repository
		@Required
		@Autowired
		@Qualifier
		@Scope
		@Component
		@Service
		@Controller
		@Bean
		@DependsOn

	SpringCore Advanced	@Lazy
		@Value
		@ComponentScan
		@Profile
		@Import
		@ImportResource
		@ContextConfiguration
		@PostConstruct
		@PreDestroy
		@Resource
		@Inject
		@Named
		@Primary
		SpringCore mini Projects
		Layered Applications /MiniProjects
		using xml driven cfgs
		using 100% code cfgs
	Introduction to SpringBoot	using spring boot
		SpringBoot starter files
		Building Spring Boot Application
		Normal Spring Manual Approach
		Maven Overview
		Spring_INITIALIZER
		STS
		Eclipse with STS Plugin
		Understanding the Spring Bootautoconfiguration
	SpringDataJPA	What is Persistence Layer
		Best practises to follow in persistence layer
		ORM Basics
		Spring Data JPA Introduction
		Differences between Spring ORM and Spring Data
		CurdRepository introduction
		CurdRepository methods for DB operations
		a) save() method
		b) saveAll() method
		c) findById() method
		d) findAllById() method

Persistence Layer using SpringBoot		e) findAll() method
		f) deleteById() method
Persistence Layer using SpringBoot		g) deleteAllById() method
		h) delete() method
		i) count()
		j) existsById()
		Custom findByXXX method syntax
		Custom Queries Execution in Data JPA
	SpringDataJPA-Advanced	JpaRepository introduction
		JpaRepository methods for DB operations
		Pagination Using Data JPA methods
		Sorting Using Data JPA Methods
		Query By Example Executor
		Generators
		Custom Generators in Spring Data
		Embedded Database Introduction
		Embedded Database vs External Database
		Application Development using Embedded Database (H2)
		Application Development Using MYSQL Database
		Application Development Using PostgreSQL Database
		Application Development Using MongoDB
SpringBoot Profiles	Profiles and logging in SpringBoot	Spring Boot Profile Components
		Introduction
		Multiple Properties files
		Properties file to YML conversion
		YML File
		Properties file Vs YML file
		Command Line Runner Example
		Real time scenarios of components
		Environment Object
		Spring Boot Custom Logging
		Logging Level
		Patterns Changes
		Rolling Logs
		SPRING WEB MVC
		Spring Web MVC Introduction

WebApplications using SpringBoot	WebApplication Development using SpringBoot	Spring Web MVC Advantages
		Spring MVC Architecture
		Introduction to Front Controller
		Controllers
		Handler Mappers
		View Resolvers
		Web Application development using Spring Boot
		Embedded HTTP Servers Introduction
		a) Embedded Tomcat Server
		b) Embedded Jetty Server
		c) Embedded Undertow Server
		Making Jetty as Default server
		Web Application Deployment in External Server
		Sending Data From UI to Controller
	Working with View as JSP and Thymleaf	a) Query Param
		b) Path Param
		Sending Data From Controller to UI
		a) Model
		b) ModelAndView
		@RequestBody annotation
		@ResponseBody annotation
		Introduction to Spring MVC Form Tag library
		Form Based application development using Spring Boot
		Thymeleaf Introduction
	Spring Mail and Exception Handling in WebApplications	Web Application with Thymeleaf
		Sending Email using Spring Boot
		Exception Handling in Spring Boot Web Application
		Spring Boot Actuators
		a) Health
		b) Info
		c) Heapdump
		d) Theadump
		e) Beans
		f) Httptrace

		g) Mappings
		h) Shutdown etc
		Unit Testing for Spring Boot Application using Junit with Mocking
	SpringSecurity in WebApplications	Code Coverage using Jacocco
		Spring Boot Security
		Basics
		Basic Authentication
		Form Based Authentication
		Authorization
		Remember me
		Different authentication providers
		Role Based Access Control
		Attribute Based Access Control
		LDAP Based
		SSL Security & TLS Security
	SpringRest	Distributed Applications
		Distributed Technologies
		SOAP vs REST
		RESTful Services Introduction
		REST principles
		XML
		XSD
		One Time operations
		Run Time Operations
		a) Marshalling
		b) Un Marshalling
		JAX-B Introduction
		JAX-B Architecture
		Applications development with JAX-B
		JSON Introduction
		XML vs JSON
		JACKSON API
		Converting Java object to JSON and vice versa using Jackson API
		GSON API
		Converting Java Object to JSON and Vice Versa using GSON API
		HTTP Protocol Details

working with Distrubuted Application s	SpringRest Building applications	HTTP Methods
		a) GET
		b) POST
		c) PUT
		d) DELETE
		HTTP Status Codes
		a) 1XX
		b) 2xx
		c) 3xx
		d) 4xx
		e) 5xx
		@RestController
		@RequestBody
		@ResponseBody
		@RequestParam
		@PathVariable
		MediaTypes
		Consumes
		Produces
		Accept Header
		Content-Type header
		REST API Development using Spring Boot
		POSTMAN
		SWAGGER & SWAGGER UI
		Exception Handling in REST API
		REST Security
		a) HTTP Basic Auth
		b) JWT
		c) OAuth2.0
		Mono Objects
		Flux Objects
		REST Client Introduction
		RestTemplate
		WebClient
		RestTemplate vs WebClient
		Reactive Programming
		Synchronous vs Asynchronous Calls

Cross Cutting concerns	Spring AOP and Spring Transaction	Spring AOP
		AOP Concepts
		Programmatic VS Declarative AOP
		Programmatic AOP
		i. Types of Advices
		ii. Types of Pointcuts
		iii. Working with proxies
		Declarative AOP
		i. Using AOP 2.0 Config element
		ii. OGNL Expressions
		Aspect J AOP
		Spring Tx
		Aop 2.0 Configuration driven Transaction Management
		Aspect J annotation based Transaction Management
	Microservices-1	Microservices
		Introduction
		Principle and Characteristics
		Usecases & Benefits
		Challenges
		Design standards
		MicroServices Communication
		i) Synchronous
		ii) Asynchronous
		Pitfalls
		Microservices Design Considerations
		Microservices per JVM?
		Microservices share the data stores?
		Microservices Transaction boundaries
		User Interfaces integration with Microservices
		Challenges in Microservices implementation
		Applying SOLID principles
		Spring Cloud
		Introduction
		Cloud Architecture

Microservices		Cloud application benefits
		Spring Cloud Config
		Introduction
		Setup version control repository
		Integration with repository
	Microservices-2	Netflix
		Introduction
		Eureka Server & Eureka Client
		Feign Client, Ribbon
		Fault Tolerance Concepts
		Circuit Breaker Pattern
		Hystrix Concepts, Hystrix Dashboard
		API Gateway
		Introduction to ZUUL
		Design standards
		Integration
		Messaging Queue Concepts (CloudBus)
		Apache KAFKA
		RabbitMQ
		JMS
		Oauth2 Concepts
		Client Types
		Protocol End Points
		Grant Types
		Implantation with Token Based
		JWT Tokens
	Deployment	Cloud Hosting
		AWS account setup
		Hosting to AWS
		Enabling cloud features like load balancing, security
		Reactive Programming using spring boot

		webflux
		Spring boot mail
		Spring boot captcha
		Spring social
	Time and Space Complexity	Introduction to Time Complexity
		Problems Demonstration
		Recurrence Relation Solving
		Introduction to Space Complexity
		Problems Demonstration
	Recursion	Introduction to Recursion
		Fibonacci Series using Recursion
		Factorial using Recursion
		Count of number of stairs using Recursion
		Power function using Recursion
	Array and 2D Array	Introduction to Array
		Memory addressing in an array
		Passing an array to functions
		Introduction to 2D array
		Storage in 2D array
	Practice Problems	Reversal of an array
		Palindrome in an array
		Missing number in an array
		Lower Bound of an element
		Square root of a number
	Strings	Introduction to String
		Storage of string
		Inbuild functions in string
	Sorting Algorithms	Comparison Sort: Selection, Insertion and Bubble
		Non-Comparison Sort: Count, Radix and Bucket
	Searching Algorithms	Linear Search
		Binary Search

Data Structure algorithm	Strings and Practice Problems	Rotation of matrix
		Search in 2D matrix
		Prefix Sum in 2D matrix
	Linked List	Introduction to Linked List
		Insertion of a node in Linked Lists
		Deletion of a node in Linked Lists
		Midpoint of a node in Linked Lists
	Practice Problems	Merge two sorted Linked Lists
		Reversing of a Linked Lists
		Merge Sort of a Linked Lists
		Floyd's Cycle Detection Algorithm
	Stack and Queue	Introduction to Stack
		Stack using Arrays
		Stack using Linked Lists
		Introduction to Queue
		Queue using Arrays
		Queue using Linked List
	Practice Problems	Valid Parenthesis
		Implementation of Stack using Queue
		Implementation of Queue using Stack
	Backtracking	Subset Permutations and Combinations
		Interview Problem: N-Queens
		Interview Problem: Solving a Sudoku
		Interview Problem: Rat in a Maze
	Generic Tree	Introduction to Tree
		Taking a tree as input and printing
		Tree traversals: Inorder, Preorder and Postorder Traversals
		Diameter of a Binary Tree
	Binary Search Tree	Introduction to Binary Search Tree
		Searching a node in BST
		Insertion of a node in BST
		Deletion of a node in BST

		Checking of BST
	Priority Queue	Introduction to Priority Queue
		Ways to implement Priority Queue
		Introduction to Heaps
		Introduction to Complete Binary Tree
		Insert and Delete Operations in Heaps
		Implementation of Priority Queue
		HeapSort
		Inbuilt Priority Queue
	HashMaps	Introduction to HashMaps
		Inbuilt HashMap
		Hash Functions
		Collision Handling Techniques
		Insert and Delete Operations in HashMap
		Load Factor
		Rehashing
	Graphs	Introduction to Graphs
		Depth First Search Traversal
		Breadth First Search Traversal
		Weighted and Directed Graphs
	Divide and Conquer	Introduction to Divide and Conquer
		Finding of maxima and minima
		Sorting Algorithms: MergeSort
		Sorting Algorithms: QuickSort
		Finding of number of Inversions
	Greedy Algorithms	Introduction to Greedy Algorithms
		Minimum Spanning Tree
		Cycle Detection in Graphs
		Kruskal's Algorithm
		Prim's Algorithm
		Dijkstra's Algorithm
		Fractional Knapsack
		Introduction to Dynamic Programming

	Dynamic Programming	Fibonnaci Series using Recursion, Memoization and Tabulation
		Longest Common Subsequence using Recursion, Memoization and Tabulation
		Edit Distance using Recursion, Memoization and Tabulation
		Knapsack Problem using Recursion, Memoization and Tabulation
		Sum of Subset using Recursion, Memoization and Tabulation
		Catalan Number Concept
Design Patterns	Design Patterns	Introduction
		Why we use Design Patterns
		Difference between Design patterns & Anti Patterns
		Pattern Elements
		Classification of Design Patterns
		Core Level Design Patterns
		Web Level Design Patterns
		Enterprise Application Level Design Patterns
	Design Patterns-01	Core Level Design Patterns
		Factory Method Design Pattern
		Singleton Design Pattern
	Design Patterns-02	Synchronized Singleton Design Pattern
		Factory Pattern Design Pattern
		Abstract Factory Design Pattern
		Builder Design Pattern
	Design Patterns-03	Prototype Design Pattern
		TemplateMethod Design Pattern
		Adapter Design Pattern
		Fast Line Reader Design Pattern
		DTO/VO Design Pattern
	Design Patterns-04	IOC or Dependency Injection Design Pattern
		Web Level Design Patterns
		MVC1 & MVC2 Design Pattern
		View Helper Design Pattern
	Design Patterns-05	Composite View Design Pattern
		Front Controller Design Pattern
		Abstract Controller Design Pattern

		Intercepting Filter Design Pattern
	Design Patterns-06	Enterprise Application Level Design Patterns
		DAO Design Pattern
		DAO Factory Design Pattern
		Business Delegate Design Pattern
	Design Patterns-07	Service Locator Design Pattern
		Session Façade Design Pattern
		Message Façade Design Pattern
System Design	System Design part 1	System Design Basics
		Key Characteristics of Distributed Systems
		Load Balancing
		Client—Server Model
		Network Protocols
		Storage
		Latency And Throughput
		Availability
		Caching
		Data Partitioning
		Indexes, Replication , Sharding
		Proxies, Redundancy
	System Design part 2	CAP Theorem and PACELC Theorem
		Web Applications
		Web App architectures : Monolithic SoA Micro Services
		Consistent Hashing
		Long Polling vs WebSockets vs Server Sent Events
		Bloom Filters
		Quorum, Leader and Follower, Heartbeat, Checksum
		Rate Limiting
		Logging And Monitoring
		Security And HTTPS
		API Design