SRET AY 205-26 IIYR SEM 4

Session No	Topic	Sub topic	Hands on problem	Leetcode problem	Output / Deliverable
1	Java Basics	JDK, JRE, JVM, Execution Flow	Trace JVM execution of a Java program	—	—
2	JVM Internals	Class Loader, JVM Models	Identify components in runtime flow	—	—
3	JVM Memory	Heap, Stack, Method Area	Memory allocation tracing	—	—
4	Garbage Collection	GC types, generations	GC scenario analysis	—	—
5	OOP Basics	Class, Object, Methods	Student Management class	—	—
6	Constructors	Types, chaining	BankAccount constructor design	—	—
7	Encapsulation	Access modifiers, data hiding	Immutable Employee class	—	—
8	Inheritance	IS-A, HAS-A	Shape hierarchy	—	—
9	Polymorphism	Compile vs Runtime	Payment system override	—	—
10	Abstraction	Abstract class vs Interface	Notification service	—	—
11	Exception Handling	Checked & unchecked	ATM exception flow	—	—
12	Custom Exceptions	User-defined exceptions	Validation exception	—	—
13	OOP Design	SOLID principles (intro)	Refactor bad code	—	—
14	Real-World OOP	Case study design	E-commerce model	—	—
1	Greedy Fundamentals	Greedy choice property + Optimal substructure	Identify greedy vs DP case studies	—	—
2	Fractional Knapsack Style	Largest-first greedy	Min coins problem	LC 881 Boats to Save People	—
3	Assign Cookies	Matching greedy	Cookie assignment	LC 455 Assign Cookies	—
4	Activity Selection	Interval scheduling basics	Max non-overlapping intervals	LC 435 Non-overlapping Intervals	—
5	Merge Overlapping Intervals	Sorting + merge	Merge intervals problem	LC 56 Merge Intervals	—
6	Job Sequencing	Schedule jobs for profit	Job sequencing	— (similar: LC 1493 Longest Subarray of 1's After Deletion, pattern: scheduling)	—
7	Min Platforms	Greedy with sorting	Minimum platforms	— (pattern: interval endpoints)	—
8	Min Cost to Connect Ropes	Priority queue greedy	Rope connection	LC 1167 Minimum Cost to Connect Sticks	—
9	Jump Game	One-pass greedy	Jump reachability	LC 55 Jump Game	—
10	Jump Game II	Minimal greedy jumps	Min jumps (extended jump game)	LC 45 Jump Game II	—
11	Gas Station	Circular greedy	Complete circuit	LC 134 Gas Station	—
12	Max Consecutive Dif/Sum	Sort + difference greedy	Max consecutive difference	—	—
13	Min Initial Vertices to Traverse	Graph greedy concept	Min vertices to reach all	LC 1557 Minimum Number of Vertices to Reach All Nodes	—
14	Lexicographically Largest Greedy	Greedy string build	Largest lexicographic subsequence	LC 402 Remove K Digits (similar greedy pattern)	—
1	DP Basics	Memoization vs tabulation & state design	Fibonacci DP	LC 509 – Fibonacci Number	—
2	Linear DP	Ways to reach stairs	Climbing Stairs	LC 70 – Climbing Stairs	—
3	Linear Selection	Max sum with choices	House Robber	LC 198 – House Robber	—
4	1D Subarray	Max contiguous sum	Kadane's DP	LC 53 – Maximum Subarray	—
5	Prefix DP	Best subarray patterns	Product of subarray	LC 238 – Product of Array Except Self	—
6	Subsequence DP	LCS fundamentals	Longest Common Subsequence	LC 1143 – Longest Common Subsequence	—
7	Edit & String	Edit operations	Edit Distance	LC 72 – Edit Distance	—
8	String DP	Palindromic subseq	Longest Palindromic Subsequence	LC 516 – Longest Palindromic Subsequence	—
9	Combination DP	Coin change cases	Coin change min coins	LC 322 – Coin Change	—
10	Knapsack DP	Value + weight optimization	0/1 Knapsack DP	(pattern, classic)*	—
11	Partition DP	Partition possibilities	Partition equal sum	LC 416 – Partition Equal Subset Sum	—
12	Grid DP	Movement paths	Unique Paths	LC 62 – Unique Paths	—
13	Grid DP Obstacles	Blocked grid travel	Paths with obstacles	LC 63 – Unique Paths II	—
14	Mixed DP	Multi-pattern fun	Triangle min path	LC 120 – Triangle	—
1	MySQL Basics	DB connect, table creation	Create Student & Course tables	LC 175 – Combine Two Tables	—
2	SELECT Queries	SELECT, DISTINCT	Basic data retrieval	LC 595 – Big Countries	—
3	WHERE Clause	Comparison, logical ops	Filter employees	LC 183 – Customers Who Never Order	—
4	ORDER BY & LIMIT	Sorting & pagination	Top-N salaries	LC 176 – Second Highest Salary	—
5	Aggregate Functions	COUNT, SUM, AVG	Salary analysis	LC 177 – Nth Highest Salary	—
6	GROUP BY	Grouping data	Dept-wise salary	LC 184 – Dept Highest Salary	—
7	HAVING	Filter groups	Dept avg salary > X	LC 185 – Dept Top 3 Salaries	—
8	INNER JOIN	2-table joins	Orders & customers	LC 175 – Combine Two Tables	—
9	OUTER JOIN	LEFT / RIGHT JOIN	Missing records	LC 196 – Delete Duplicate Emails	—
10	Multi-Table JOIN	3–4 table joins	Employee-Dept-Project	LC 570 – Managers with ≥5 Reports	—
11	Subqueries	Nested queries	Higher than avg salary	LC 181 – Employees Earning More Than Managers	—
12	Correlated Subquery	Row-wise dependency	Dept max salary	LC 184 – Dept Highest Salary	—
13	Indexing	Index types, usage	Index performance test	LC 182 – Duplicate Emails	—
14	Query Optimization	Execution plan basics	Optimize slow query	LC 178 – Rank Scores	—
1	Project Overview	Problem statement & scope	Understand business requirements	—	Clear problem definition
2	OOP Design	Identify classes & roles	Draw class diagram	—	Class structure finalized
3	Encapsulation	Data hiding & validation	Implement private fields + getters/setters	—	Secure class design
4	Inheritance	IS-A & HAS-A relationships	User → Student / Admin	—	Reusable hierarchy
5	Polymorphism	Method overriding	Fee / score calculation logic	—	Runtime behavior demo
6	Abstraction	Interfaces & loose coupling	PaymentService / ReportService	—	Clean architecture
7	Exception Handling	Custom exceptions	EnrollmentException, PaymentException	—	Robust error handling
8	DB Design	ER diagram	Student–Course–Enrollment–Payment	—	Database blueprint
9	Normalization	1NF → 3NF	Remove redundancy	—	Optimized schema
10	Table Creation	Keys & constraints	Create tables in MySQL	—	Working DB
11	CRUD Operations	Insert, Update, Delete	Student & enrollment CRUD	—	Data persistence
12	Joins	3–4 table joins	Student course report	—	Complex SQL mastery
13	Subqueries	Nested & correlated	Top-scoring students	—	Advanced queries
14	Optimization	Indexing & tuning	Improve slow queries	—	Interview-ready project