Java Course Syllabus

First Part – Java SE & DSA

1. Introduction / Software setup
    a. Introduction to ICT (Career plan)
    b. What is programming?
    c. What are programming languages?
    d. What is VCS (Git / GitHub)?
    e. JDK / JRE / JVM / IDE?
2. Java Basics
    a. Java syntax ("Hello, World!" in Java)
    b. Application lifecycle: writing, compiling (to bytecode), running
    c. Application entry point (public static void main (String... args))
    d. Print to console (System.out.println() function)
    e. Java basics (Data types, Variables, Operations)
    f. Operators
        I. Arithmetic operators
        II. Arithmetic Operators
        III. Relational Operators
        IV. Logical Operators
        V. Assignment Operators
        VI. Miscellaneous Operators
    g. Practice: "Problem solving"
3. Control Flow
    a. Conditional statements (if/else/else if/switch-case)
    b. Loops (for/while/do-while/enhanced for loop)
    c. Types of variables
        I. Instance variables
        II. Local variables
        III. Static variables
    d. Break/continue statements
    e. Nested conditions and loops
    f. Input from keyboard (Scanner)
    g. Practice: "Basic calculator app"
4. Methods
    a. What is a method in Java?
    b. Parametric and non-parametric methods
    c. Methods with return or void

d. Recursion (basic)
e. Practice: "Calculator app with switch and methods"

5. Arrays
    a. One dimensional arrays
    b. Operations on a array (fill, print, copy etc.)
    c. Two and more dimensional arrays
    d. Practice: "Problem solving"
6. String
    a. String under the hood
    b. String concatenation:
        I. "+" operator for strings
        II. StringBuilder
        III. StringBuffer
        IV. Comparison of above solutions
    c. Methods of String class
    d. Practice: "Problem solving"
7. Practice
    a. General repetition of lessons learned
    b. Practice "Problem solving"
8. First exam here
9. Object-Oriented Programming (OOP) #1
    a. Object and class
    b. Code conventions
    c. Access modifiers – Encapsulation
    d. References/Garbage collectors
    e. Pass by value/reference
    f. Static and non-static
    g. Class loading
10. Object-Oriented Programming (OOP) #2
    a. Constructors
    b. Inheritance and Polymorphism
    c. Keywords: this and super
    d. Wrapper types
    e. Overriding and Overloading
    f. equals() and hashcode()
    g. toString()
11. Object-Oriented programming (OOP) #3

a. Casting (Down casting/Upcasting)
b. Abstraction (Abstract)
c. Interfaces

12. Exceptions
    a. Error
    b. Exception
    c. Checked and unchecked exceptions
    d. Try-catch (+finally)
    e. Try-with-resources
    f. Own Exception
    g. Throw/throws
13. File Input-Output (I/O), Date
    a. File reading and writing with “io”
    b. File reading and writing with “nio”
    c. Date and Time in Java
14. Java 8 (Stream API and Collections), 3-layer project structure
    a. Lambda
    b. Stream
    c. Optional
    d. Generics
    e. Collections
    f. Comparator and Comparable
    g. Iterator and Iterable
    h. DAO
15. Practice: “1. Memory, 2. File managed app”
16. Algorithms and Data Structures #1
    a. Overview
    b. Complexity notations
    c. Binary search
    d. Sorting algorithms
17. Algorithms and Data Structures #2
    a. Linked Lists
    b. Hash implementation
    c. Stack
    d. Queue
    e. Deque
    f. Practice: “Problem solving”

18. Database/SQL #1
    a. Intro to databases
    b. Oracle/MySQL/PostgreSQL overview
    c. Environment setup
    d. DDL/DML
    e. CRUD (create/retrieve(read)/update/delete) operations
    f. Practice: "Database operations"
19. Database/SQL #2
20. Database/SQL #3
21. Database/SQL #4
22. Database/SQL #5
23. Practice
    a. General repetition of lessons learned
    b. Practice "Problem solving"
24. Second exam here

Second Part – Java Web

1. Web introduction
    a. Intro
    b. HTML
    c. CSS
    d. JavaScript
    e. jQuery
2. HTTP
    a. HTTP
    b. Request – Response
    c. Server
    d. Servlet
    e. Handler
    f. Mapping
3. Server and Servlet
    a. Jetty / Tomcat server
    b. Parameter parsing

    c. Server / Servlet lifecycle
4. Web Navigation and HTML Generation
    a. Static content (IMG, JS, CSS, etc.)
    b. Freemarker
    c. File upload
5. Filters and Basic Authorization
6. JSON, XML, Jackson, REST, CQRS
7. REST JSON consuming
    a. Basic
    b. REST JSON/XML consuming
    c. Parsing
    d. Authorization
8. Third Exam here
9. Spring intro, Framework vs Library
10. Inversion of Control and Dependency Injection
11. Lifecycle
12. MVC, REST, static resources
13. Consuming and serving REST
14. Cookies, Session
15. DTO Pattern
16. DTO, Lombok, Nested entities
17. JPA, ORM basics, relations, validations
18. JPA, Hibernate, Spring Data
19. JPA, Repositories, Pageable
20. Spring Security Architecture. Basic Auth (login+password)
21. Spring Security. Roles, Permissions, Configuration
22. Spring Security. Stateful
23. Spring Security. Stateless, Tokens. JWT token
24. Deployment, Packing, Heroku
25. Final Exam here
26. Final Lesson/Final Recap/ Q&A session