Module 3 – Core Competency

3.1 Object-Oriented Programming in Java

Course Outcomes:

1. Explain the fundamental concepts of Object-Oriented Programming (OOP) and differentiate it from procedural programming.
2. Apply programming constructs, arrays, and methods to build structured Java applications.
3. Analyze variable types, data types, and access control to write efficient and organized Java code.
4. Evaluate and select appropriate OOP features such as inheritance, interfaces, and abstract classes for building flexible and reusable code.
5. Design and develop Java applications using packages, exception handling, and lambda expressions to meet real-world problem requirements.

List of topics:

Sr. No.	Name of Topic	Industry Application	No. of Lectures
1	Introduction	Software development, platform independence, system architecture	2
2	Understanding Java Technology and Its Environment	Enterprise applications, mobile development, web servers	2
3	Exploring Variable Types Based on Declaration Position and Behavior (local, instance, static variables), Including Primitive and Reference Data Types	Memory management, performance optimization, debugging	3
4	Accepting User Input in Java Programs	Interactive applications, form processing, CLI tools	2
5	Programming Constructs (Sequence, Selection, Iteration, Transfer Statements)	Control flows in automation, algorithms, simulations	5

6	Working with Java Arrays	Data storage, statistical computations, image processing	4
7	The String API	Text parsing, search engines, data formatting	4
8	Creating and Using Methods	Code modularity, reusable libraries, API design	4
9	Describing and Using Objects & Classes	Object-oriented programming, design patterns, frameworks	5
10	Encapsulation	Security, code maintainability, modular applications	3
11	Interfaces	Polymorphism, API design, plugin architecture	3
12	Abstract Classes	Partial implementations, code reuse, architecture design	3
13	Inheritance	Code reuse, hierarchical modeling, framework development	4
14	Exception Handling	Error recovery, system robustness, fault tolerance	3

3.2 Database Management System (DBMS)

Course Outcomes:

1. Understand database design principles including functional dependencies and normalization.
2. Write basic and advanced SQL queries to manipulate and retrieve data.
3. Implement triggers, stored procedures, and functions for automated database operations.
4. Manage transactions and concurrency to ensure data integrity and consistency.
5. Optimize database performance for large-scale applications.

List of topics:

Sr. No.	Name of Topic	Industry Application	No. of Lectures
1	Functional Dependencies	Database normalization, data integrity, schema design	3
2	Normalization	Avoid redundancy, improve data consistency, storage efficiency	3
3	Basics of SQL	Data retrieval, reporting, transaction processing	4
4	Advanced Queries	Complex reporting, data aggregation, analytics	4
5	Triggers	Audit trails, automatic updates, real-time monitoring	3
6	Cursors	Row-by-row processing, reporting automation, batch jobs	3
7	Stored Procedures & Functions	Business logic encapsulation, reusable routines, data validation	4
8	Transactions	Banking, reservations, data integrity, rollback mechanisms	4
9	Deadlocks & Concurrency	Multi-user systems, database locks, synchronization	4
10	Performance Optimization	Query tuning, indexing, caching, scalability	3

3.3 Networking

Course Outcomes:

1. Understand network models, protocols, and architecture.
2. Configure devices and implement basic network security measures.
3. Analyze and troubleshoot network issues using proper tools and techniques.
4. Apply IP addressing, routing, VLANs, and other network protocols in practical scenarios.
5. Explore advanced concepts like network virtualization, automation, and secure communication channels.

List of topics:

Sr. No.	Name of Topic	Industry Application	No. of Lectures
1	Basic Fundamentals and Initial Device Configuration	Setting up routers/switches, network bootstrapping, enterprise deployment	3
2	Protocols and Models	Internet communication, layered architecture, fault isolation	3
3	Physical Layer and Number System	Data encoding, transmission media, binary systems, modulation	3
4	Data Link Layer and Ethernet Switching	MAC addressing, error control, LAN communication	4
5	Network Layer ARP and Basic Configuration	Address resolution, IP routing, packet forwarding	3
6	IP Addressing and Subnetting	Efficient network design, address allocation	4
7	Transport Layer	Data integrity, segmentation, flow control, TCP/UDP	3
8	Application Layer	Client-server apps, DNS, HTTP, email, APIs	3
9	Basic Network Design and Security	LAN/WAN architecture, access control, segmentation	3

10	Basic Device Configuration and Switching Concept	VLAN, port security, interface setup	3
11	VLAN Inter-VLAN Concept	Traffic separation, optimized routing, scalability	3
12	STP and Ethernet Channel	Loop prevention, redundancy, link aggregation	3
13	DHCP, SLAAC and FHRP Concept	IP allocation, IPv6 addressing, fault tolerance	3
14	Switch and LAN Security Concept	Access control, port security, VLAN isolation	3
15	Routing, WLAN and Troubleshooting Concepts	Network management, fault isolation, wireless networks	4
16	OSPF Routing Concept	Scalable routing, dynamic path selection	3
17	Network Security and Access List	Firewall rules, access restrictions, traffic filtering	3
18	NAT, WAN, VPN and IP Sec Concept	Remote access, secure communication, internet routing	4
19	Network Design Management Troubleshooting Concepts	Scalable architecture, fault detection, optimization	3
20	Network Virtualization and Automation	Cloud deployments, SDN, automation workflows	4