

COURSE OVERVIEW

Introduction to Software Architecture

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Course Details:

- **Course Title:** Introduction to Software Architecture
- **Total Duration:** 4 Sessions (2 hours each)
- **Frequency:** Weekly
- **Target Audience:** Developers with at least 2 years of experience

Course Objectives:

- Understand the Role of a Software Architect
- Learn Key Architectural Patterns and Styles
- Master System Design Principles
- Database Management Proficiency
- Enhance Security and Data Protection
- Optimize Performance and Caching
- Scalability Best Practices
- Gain hands-on experience through practical examples and exercises.

Evaluation:

- Continuous assessment through hands-on exercises & quiz

Session 1

Topics: Software Architecture

- Understanding the Role of a software architect
- Architectural Patterns and Styles
- Architectural decision-making process
- Key architectural considerations and Trade-off

Topics: System Design Principle

- Design principles for scalability, maintainability, and performance
- Modularity and separation of concerns
- Architectural patterns (e.g., layered, client-server, microservices)
- Decomposition strategies and coupling and cohesion concepts

Session 2

Topics: Database Management

- Relational and NoSQL databases overview
- Data modeling and normalization
- Database scalability and sharding
- Replication and consistency strategies

Scalability

- Horizontal Scaling: Design systems to scale by adding more servers (horizontal scaling), not just by upgrading existing ones (vertical scaling).
- Decoupling Components: Use microservices and asynchronous messaging to decouple system components, improving scalability and fault tolerance.
- Data Partitioning: Implement data partitioning techniques like sharding to distribute load across databases efficiently.
- Caching Strategies: Use caching layers (e.g., Redis, CDN) to reduce load on databases and improve response times for frequently accessed data.
- Load Balancing: Employ load balancers to evenly distribute traffic across servers, ensuring no single node is overwhelmed.

Session 3

Topics: Security and Data Protection

- Security Considerations in Software Architecture
- Secure coding practices and common vulnerabilities
- Encryption and data protection techniques
- Privacy and regulatory compliance (e.g., GDPR, HIPAA)

Session 4

Topics: Performance Optimization and Caching

- Identifying performance bottlenecks
- Profiling and benchmarking applications
- Caching strategies and cache coherence
- Database optimization techniques

This outline dedicates a full session to the Software Architecture, ensuring that participants can thoroughly understand and apply these key concepts in their future works.

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