SOA Syllabus

Revision 2.0, Mar 2025 (Updates in **Bold**)

Unit 1: Introduction to Service-Oriented Architecture	
1.1	Overview of Service-Oriented Architecture - Idea of a Service, Key Characteristics, Historical Context, **AI-Driven Services**
1.2	Principles and Concepts of SOA - Service Loose Coupling, Service Reusability, Service Abstraction, **AI Considerations**
1.3	Evolution and History of SOA - Early Web Services, Emergence of SOA Standards, **Transition to Microservices & Containerization, DevOps and MLOps, Role of Cloud Providers & AI Services:**
1.4	Benefits and Challenges of SOA - Business Agility, Interoperability, Challenges in Implementation, **AI Integration Challenges**
1.5	Contemporary Trends in SOA - Microservices Architecture, Cloud Computing and SOA - Serverless Computing and SOA, **AI/ML in the Service Ecosystem**
Unit 2: SOA Design and Modeling	
2.1	Service Design Principles and Patterns - Service Cohesion, Granularity, Design for Change, **Service Design in AI**
2.2	Service Contract Design and Management - Interface Definition Languages (IDLs), Contract-First Design, Versioning and Evolution, **AI and gRPC**
2.3	Designing for Scalability and Resilience - Load Balancing, Fault Tolerance, Circuit Breaker Pattern, **AI Workloads**
Unit 3: SOA Implementation Technologies	
3.1	Web Services Standards - Simple Object Access Protocol (SOAP), Representational State Transfer (REST) - GraphQL, **gRPC**
3.2	Microservices Architecture and its Relationship with SOA - Decentralized Data Management, Independent Deployment, **MLOps & Microservices**: - Infrastructure Automation, **Automated Model Deployment**
3.3	Containerization and Orchestration

	- Docker Container, Kubernetes Orchestration, **Specialized AI/ML Orchestration,** Service Mesh Technologies, **Observing AI Microservices**
3.4	Event-Driven Architecture (EDA) and SOA - Event Sourcing, Command Query Responsibility Segregation (CQRS), **AI Use Case** - Event-Driven Messaging Systems, **Pub/Sub patterns, Streaming Pipelines for AI**
3.5	API Management and Governance - API Design Principles, **AI-Specific API Considerations** - Developer Portals, **AI "Model Catalog"** - Rate Limiting and Quotas, **AI Endpoint Limits**
Unit 4: Security and Governance in SOA	
4.1	Security Considerations in SOA - Understanding Threat Models, Common Security Risks in SOA **Threats in AI-Driven Services** - Security Design Patterns, **Zero Trust for distributed microservices (including AI endpoints)**
4.2	Data Encryption and Integrity - Message-Level Encryption (XML Encryption), Digital Signatures (XML Signature), - **JSON & gRPC, Data at Rest for AI Models** - Secure Hash Algorithms (SHA), Securing APIs and Web Services,
4.3	API Security Best Practices - Securing RESTful APIs, Web Service Security Standards (WS-Security) - **Securing AI Inference APIs**
4.4	XML Security and SAML Assertions - XML Security Considerations, Introduction to SAML - **JSON-based Security** - SAML Assertions and Assertions Consumers, **Modern Alternatives with JWT/OAuth 2.0 vs. SAML usage in microservices and AI service endpoints**
Unit 5: SOA Emerging Trends	
5.1	Serverless Computing and its Impact on SOA - Function-as-a-Service (FaaS), Event-Driven Architectures, **AI Use Cases in Serverless** - Operational Characteristics, **Observability in AI-Driven Serverless**
5.2	Artificial Intelligence (AI) and Machine Learning (ML) in SOA - Intelligent Agents, Predictive Analytics, Natural Language Processing (NLP), **AI Orchestration and Workflow**
5.3	Edge Computing and SOA Integration, - , Edge Gateway Architectures, Low-Latency Data Processing. Offline Capabilities, **AI Workloads at the Edge**