API DEVELOPMENT, INTEGRATION AND MICROSERVICES ARCHITECTURE COURSE

Introduction

This programme equips software developers and IT professionals with the skills required to design, build, secure and manage application programming interfaces and distributed software services. It covers RESTful APIs, HTTP communication, JSON data exchange, API authentication, documentation, integration patterns and microservices architecture. Participants learn how applications communicate, how APIs expose business functionality and how organizations integrate internal systems with external platforms. The course explores API design principles, request validation, error handling, versioning, rate limiting, service discovery and monitoring. It also introduces microservices architecture, including service decomposition, inter-service communication, data management, resilience and deployment considerations. Practical exercises involve building APIs, connecting applications, documenting endpoints and designing integration solutions for enterprise environments.

Course Objectives

- Explain API concepts, communication protocols and integration architectures.
- Design RESTful APIs using appropriate resource structures and HTTP methods.
- Develop API endpoints with input validation and error handling.
- Implement authentication, authorization and basic API security controls.
- Integrate applications with internal and external services.
- Explain microservices architecture and its operational trade-offs.
- Test, document, monitor and maintain APIs and distributed services

Course Modules

> Module 1: API Fundamentals and Integration Architecture

P.O Box 7254- 01000
www.trustgatecorporateskills.co.ke
Location Thika & Nairobi

- API concepts, purposes and business applications.
- Client-server communication and request-response workflows.
- REST, SOAP, webhooks and event-driven integration concepts.
- API gateways, service boundaries and integration architecture patterns.

> Module 2: HTTP Protocols and RESTful API Design
- HTTP methods, status codes, headers and request bodies.
- Resource naming, URI design and endpoint organization.
- JSON data structures, serialization and response formats.
- Idempotency, pagination, filtering and consistent API behaviour.

> Module 3: API Development and Implementation
- Setting up API development environments and frameworks.
- Building endpoints, routes, controllers and request handlers.
- Input validation, business logic and response generation.
- Exception handling, error responses and application logging.

> Module 4: API Data Management and Database Integration
- Designing data models for API-driven applications.
- Connecting APIs to relational databases.
- CRUD operations, transactions and data consistency.
- Database validation, query efficiency and error management.

> Module 5: API Authentication and Security
- Authentication, authorization and access control principles.
- API keys, session-based authentication and token-based approaches.
- OAuth 2.0 and OpenID Connect fundamentals.
- Rate limiting, input validation, secrets management and common API vulnerabilities.

> Module 6: API Documentation, Testing and Versioning
- API documentation principles and OpenAPI specifications.
- Testing endpoints, requests, responses and error conditions.
- API versioning, backward compatibility and deprecation.
- Automated testing, contract testing fundamentals and regression checks.

> Module 7: Enterprise API Integration
- Integrating enterprise applications and third-party services.
- Data mapping, transformation and synchronization.

- Webhooks, callbacks and event-driven communication.
- Retry policies, timeout handling and integration error recovery.

> Module 8: Microservices Architecture and Design

- Monolithic applications versus microservices.
- Service decomposition, bounded contexts and domain-driven design fundamentals.
- Synchronous and asynchronous service communication.
- Service ownership, independent deployment and architectural trade-offs.

> Module 9: Microservices Operations and Reliability

- Service discovery, API gateways and routing.
- Containers and deployment concepts for distributed services.
- Centralized logging, monitoring, tracing and performance analysis.
- Resilience patterns, including timeouts, retries and circuit breakers.

> Module 10: API Integration and Microservices Project

- Defining integration requirements and designing an API contract.
- Developing endpoints and integrating a database or external service.
- Implementing authentication, documentation and automated tests.
- Presenting an integration solution with deployment and monitoring recommendations.