

AWS Lambda: From Basics to Advanced Applications

Course Introduction:

This training program develops practical and architectural expertise in AWS Lambda and serverless application design. Participants will first build a strong foundation in AWS Lambda core concepts, then progressively integrate key AWS services such as Amazon S3, DynamoDB, EventBridge, IAM, VPC, CloudWatch, and X-Ray into event-driven, production-grade architectures.

Day 1: Lambda Foundations & Core Concepts

Module 1: Serverless & Event-Driven Architecture

- Serverless computing fundamentals
- Event-driven design patterns
- Use cases and industry scenarios

Module 2: AWS Lambda Overview

- Lambda architecture and components
- Supported runtimes and languages
- Lambda pricing model and cost optimization

Module 3: Lambda Execution Model

- Invocation lifecycle
- Cold starts vs warm starts
- Stateless design principles

Module 4: Lambda Function Development

- Function creation (Console, CLI)
- Handler structure
- Environment variables
- Memory and timeout configuration

Module 5: Deployment Packaging

- Deployment package structure
- Dependency management
- Introduction to Lambda Layers

Lab

- Create and deploy a Lambda function
- Configure environment variables, memory, timeout
- Package dependencies and use Layers

DAY 2 — Configuration, Scaling & Event Sources

Module 6: Concurrency, Scaling & Performance

- Concurrency model
- Reserved vs provisioned concurrency
- Scaling behavior and limits
- Performance optimization techniques

Module 7: Lambda Triggers & Event Sources

- Event sources vs triggers
- Synchronous vs asynchronous invocation
- Poll-based vs push-based models

Module 8: Service Integrations

- Lambda with Amazon S3 (event notifications)
- Lambda with DynamoDB Streams
- Lambda with EventBridge (event buses & rules)

Module 9: Advanced Event Handling

- Lambda Destinations (success/failure)
- Retry behavior and failure handling
- Dead Letter Queues (DLQ)

Module 10: Step Functions Integration

- Orchestrating workflows
- State machines and coordination patterns
- Error handling strategies in workflows

Lab

- Build event-driven workflows:
 - S3 → Lambda
 - Dynamo DB Streams → Lambda
 - Even Bridge → Lambda
- Implement async handling with Destinations

DAY 3 — Security, Networking & Observability

Module 11: IAM & Security for Lambda

- IAM roles and policies
- Least privilege design
- Lambda resource-based policies
- Cross-service permissions

Module 12: VPC Integration

- Lambda inside a VPC
- Subnets, route tables, NAT Gateway
- Security Groups vs NACLs
- Performance and cold start impact

Module 13: Logging & Monitoring

- Amazon CloudWatch Logs and Metrics
- Custom metrics and dashboards
- Alarms and alerting strategies

Module 14: Distributed Tracing

- AWS X-Ray fundamentals
- Traces, segments, and service maps
- Debugging distributed applications

Module 15: Error Handling & Resilience

- Exception handling patterns
- Retry strategies
- Idempotency design

Lab

- Configure IAM roles and policies

- Enable CloudWatch logging and alarms
- Activate X-Ray tracing
 - Deploy Lambda inside a VPC

DAY 4 — Deployment, Versioning & Production Architecture

Module 16: Versioning & Traffic Management

- Lambda versions and aliases
- Traffic shifting techniques
- Canary and blue/green deployments

Module 17: Infrastructure as Code

- AWS SAM fundamentals
- AWS CDK overview
- Automated deployment pipelines

Module 18: Deployment Strategies

- CI/CD integration
- Safe deployment patterns
- Rollback strategies

Module 19: Cost Optimization

- Lambda pricing deep dive
- Cost drivers (duration, memory, requests)
- Optimization techniques

Final Project and Assessment

Design and deploy a **production-grade serverless application** including:

- Lambda functions
- S3 / DynamoDB / EventBridge integration
- IAM security model
- Monitoring (CloudWatch)
- Tracing (X-Ray)
- Deployment using SAM or CDK
- Versioning and traffic shifting