Beginner to Advanced Go Programming

Duration: 4 days
Prerequisites: Working Experience of Any Programming Language

Day 1: Go Language Foundations

Module 1: Language Basics & Core Constructs

Topics:

- Files, Keywords, Identifiers
- Operators, Types, Functions, Constants
- Pointers, Structures, Methods
- Maps, Arrays, Slices
- Go CLI
- Interface (Intro level)

Lab:

- Build a CLI-based calculator
- Create and manipulate a struct with embedded methods
- Demonstrate type embedding and basic interface usage

Module 2: Error Handling Basics

Topics:

- Error Handling
- Panic, Defer, Error, Recover

Lab:

- Implement error-wrapped function
- Demonstrate defer and panic recovery in CLI tools

Day 2: Concurrency, Dependency & Project Setup

Module 3: Concurrency and Control Flow

Topics:

- Go Routine, Channel, Buffer
- Interfaces, Select, Mutex (Advanced concurrency)

Lab:

- Build a worker pool using goroutines and buffered channels
- Use mutex to protect shared state
- Demonstrate fan-in/fan-out patterns

Module 4: Dependency & Tooling

Topics:

- Go Dependency Management Tools
- Semantic Versioning
- Scripts and Repositories
- Go Libraries
- Building CLI's – Cobra, urfave/cli

Lab:

- Setup a Go module with multiple packages
- Write a custom library and use it
- Build a CLI tool with subcommands using Cobra

Day 3: Testing, Persistence & Integration

Module 5: Testing in Go

Topics:

- Unit Testing
- Integration Testing
- Behaviour Testing
- Gherkin Framework
- E2E Testing

Lab:

- Write table-driven tests
- Setup Ginkgo/Gherkin for behavior testing
- Create and validate end-to-end tests for a small API

Module 6: Persistence & Messaging

Topics:

- SQL Fundamentals
- Interacting with SQLite
- Interacting with Kafka
- Marshalling and UnMarshalling JSON
- GORM and ORMs

Lab:

- Build a CRUD API using SQLite and GORM
- Serialize/deserialize complex nested JSON
- Connect and send messages to a Kafka topic

Day 4: Advanced Patterns, Web Dev & Deployment

Module 7: Design Patterns & Advanced Concepts

Topics:

- Structural, Creational, Behavioural Design Patterns
- Concurrency Management Patterns
- Stability and Graceful Shutdowns

Lab:

- Implement singleton and factory patterns
- Apply strategy pattern with interfaces
- Build a service with context-aware shutdown logic

Module 8: Full-stack Go & Deployment

Topics:

- Web Frameworks: Gorilla, gofiber, buffalo
- Logging: Apex, Zerolog, Zap
- Real-Time Communication: Centrifugo
- API Clients – REST, Microservices
- Basic Authentications
- Routers and Middleware

Lab:

- Build a REST API with middleware (auth, logging)
- Implement WebSocket/real-time updates via Centrifugo
- Log events using structured logging (Zap/Zerolog)