Module 1: Software Development Life Cycle (SDLC) & V-Model

Introduction to SDLC

- Importance of structured development.
- Stages in SDLC and their deliverables.

Understanding the V-Model

- What is V-Model?
- Why V-Model is widely used in automotive projects.

Mapping Development & Testing

- Requirement gathering vs Requirement validation.
- Coding vs Unit Testing.
- Integration vs System Testing.

Case Study

- V-Model in real-time automotive embedded projects.

Module 2: Automotive Protocols (CAN & LIN)

Introduction to Automotive Communication

- Role of protocols in ECU-to-ECU communication.

CAN Protocol

- Message structure, ID types, error handling.
- Applications in infotainment and ADAS.

LIN Protocol

- Master-slave concept.
- Scheduling and synchronization.
- Use cases in body electronics.

Comparison & Applications

- CAN vs LIN: Where to use which protocol.

Module 3: Real-Time Test Bench Setup & ECU Testing

Test Bench Components

- Hardware-in-the-Loop (HIL).
- Interfaces and measurement devices.

Setup & Configuration

- Wiring harness, simulators, and hardware setup.

Testing Infotainment & ADAS ECUs

- Infotainment: Display, audio, connectivity.
- ADAS: Sensors, camera, safety controls.

Practical Demonstration

- Running real-time test cases on bench.

Module 4: Diagnostics & UDS Protocol

Introduction to Vehicle Diagnostics

- Role of diagnostics in ECU communication.

UDS Protocol Basics

- Services (Read/Write Data by ID, DTCs, Reset).

Practical Use Cases

- Flashing ECU.
- Reading live vehicle data.

Hands-on Practice

- Executing UDS commands on CANalyzer/Canoe.

Module 5: Test Case Design & Testing Techniques

Test Case Fundamentals

- Requirement analysis and scenario identification.

Practical Test Case Writing

- Converting requirements into test steps.

Testing Methods

- Functional testing.
- Regression testing.
- Performance testing.
- Integration testing.

Best Practices

- Traceability, reusability, clarity.

Module 6: Tools & Requirement Management

Vector Tools

- Canoe basics.

- CANalyzer usage for debugging.

Requirement Management Tools

- DOORS, Jama – creating and managing requirements.

Traceability Matrix

- Linking requirements to test cases.

Hands-On Practice

- Creating simulations in Canoe.

Module 7: Defect Management & Project Handling

Defect Lifecycle

- Bug logging, tracking, fixing, and closure.

Using JIRA

- Creating tickets, assigning, workflows.

Severity & Priority

- Defining and handling defect criticality.

Project Handling

- Managing deliverables in real-time projects.

- Agile & Scrum in automotive testing.

Module 8: CAPL Scripting & Career Preparation

CAPL Scripting Basics

- CAPL environment in Canoe.

- Writing simple CAPL functions.

Automation

- Automating test cases with CAPL.

Career Preparation

- Demos, mock interviews, HR prep.

Capstone Project

- End-to-end ECU testing with diagnostics, CAN/LIN, and defect reporting

***Note:** This outline is comprehensive and can be tailored based on course duration, depth of coverage, and the participants expertise levels. As technology continues to evolve, it is crucial to review and update the content regularly to incorporate emerging tools, practices, and industry best standards.