ADAS_ECU_SIMULATION_TESTING

Course Objectives	• Explore Automotive and Vehicle Electronics & Electrical (E&E) Architecture, covering major domains and subsystems. • Learn the V-model Life Cycle methodology and its application in automotive systems development. • Explore Network Communication in vehicles, including Partner Electronic Control Units (ECUs), DBC files, and Software Development Life Cycle (SDLC). • Gain insights into Testing methodologies, emphasizing the importance of testing and the Software Testing Life Cycle (STLC). • Introduce Communication Protocols, focusing on the Controller Area Network (CAN) protocol commonly used in automotive systems. • Gain hands-on experience with Vector CANoe software, including demo versions and sample configuration overviews. • Practice ECU simulation using CANoe and demonstrate the use cases, DBC creation, simulation setup, panel configuration, and CAPL usage. • Develop skills in writing, reviewing, and executing test cases for CANoe scenarios using Excel sheets. • Explore Gateway concepts and learn CAPL programming for Unified Diagnostic Services (UDS) implementation in CANoe simulations.
Course Outcomes	• Exhibit the process of integrating simulated ECUs into larger vehicle network simulations, including testing interoperability, verifying communication protocols, and ensuring compatibility with other ECUs • Apply learned concepts and skills to real-world projects, including developing ECU simulation models, designing test scenarios, executing tests, and analysing results to meet project objectives. • Hands-on experience in testing and validating simulated ECUs • Develop proficiency in utilizing Vector CANoe software for ECU simulation and network communication analysis,

	enhancing students' capabilities in automotive engineering tools. ● Acquire practical skills in configuring and customizing simulation environments in CANoe, enabling students to replicate real-world scenarios for testing and validation purposes.

Course Duration: 45 Hours

Course Content:

UNIT I INTRODUCTION TO ECU SIMULATION

Introduction to Automotive, Vehicle E&E Architecture, Partner ECU Simulation, Vehicle sub-system, and Network communication.

UNIT II AUTOMOTIVE COMMUNICATION PROTOCOLS

Introduction about different types of communication protocols, Importance of CAN Protocol, Frame format, and different types. Applications of communications protocols.

UNIT III VECTOR CANOE TOOL INTRODUCTION

Install & Configuration of CANoe, Tool Overview, creating a sample Configuration about CANoe, how to send the messages and Interactive generator block, Introduction about CAPL Browser.

UNIT IV REAL-TIME USE CASES WITH VECTOR CANOE

How to understand the OEM requirements, practice with the use cases how to use the CANoe tool and CAPL Scripting part, and how to write the test cases.

UNIT V INTRODUCTION UDS PROTOCOL

Understand the Diagnostics concepts, OBD Tool, Onboard and Off-board diagnostics, UDS With CANoe

Test Projects:

Use Cases:

Industry Use-Cases

1**. Airbag safety system**: The vector CANoe tool is commonly used for developing, testing, and diagnosing embedded systems and networks, including automotive systems like airbag safety systems. the typical process involved in using CANoe for airbag safety system development and testing.

Task 1: How to understand the OEM Requirements

Task 2: Based on the Requirement of how to use the V Model

Task 3: How to create the Database, simulation setup, panel creation, and how to communicate each ECU through CAPL Script as per requirement.

Task 4: How to create the Test cases and review the test cases.

2**.Automated Emergency Braking**: Automated emergency braking (AEB) uses sensors to detect potential collisions, activates braking systems autonomously, and reduces the severity or avoids collisions altogether. AEB improves vehicle safety by assisting drivers in avoiding or mitigating collisions with other vehicles, pedestrians, or obstacles.

Task 1: How to understand the OEM Requirements

Task 2: Based on the Requirement of how to use the V Model

Task 3: How to create the Database, simulation setup, panel creation, and how to communicate each ECU through CAPL Script as per requirement.

Task 4: How to create the Test cases and review the test cases.

3**.Tire Pressure Monitoring System:** TPMS (Tire Pressure Monitoring System) monitors tire pressure, alerts drivers of low- pressure conditions, and enhances vehicle safety by preventing accidents caused by underinflated tires. It improves fuel efficiency, extends tire life, and ensures optimal vehicle handling and performance.

Task 1: How to understand the OEM Requirements

Task 2: Based on the Requirement of how to use the V Model

Task 3: How to create the Database, simulation setup, panel creation, and how to communicate each ECU through CAPL Script as per requirement.

Task 4: How to create the Test cases and review the test cases.

4.**Cruise control system:** Cruise control maintains a steady vehicle speed set by the driver, reducing driver fatigue on long trips and improving fuel efficiency. It automatically adjusts throttle or braking to keep the vehicle at the desired speed, enhancing driving comfort and convenience.

Task 1: How to understand the OEM Requirements

Task 2: Based on the Requirement of how to use the V Model

Task 3: How to create the Database, simulation setup, panel creation, and how to communicate each ECU through CAPL Script as per requirement.

Task 4: How to create the Test cases and review the test cases.