Michigan Alliance for Greater Mobility Advancement

Course Title: Emergency Braking

Course Length: 1 day

Time Online: N/A

Time in Class: 8 hours

Time in Lab: N/A

Class Size: Minimum 5 / Maximum 24

Price Per Student: $1,150.00*

Location: Company Site

Course Description:

Active Safety, Advanced Driver Assistance Systems (ADAS) are now being introduced to the marketplace as they serve as key enablers for anticipated autonomous driving systems. Automatic Emergency Braking (AEB) is one ADAS application which is either in the marketplace presently or under development as nearly all automakers have pledged to offer this technology by the year 2022. This one-day course is designed to provide an overview of the typical ADAS AEB system from multiple perspectives. A technical overview of the development cycle processes specific to AEB, including system level requirements and design architecture will be presented as well as design considerations for AEB from a functional safety (ISO-26262) perspective. A general overview of algorithm concepts for the various AEB subsystems will be demonstrated followed by a review of AEB system test and validation methods. Finally, discussion is facilitated toward understanding customer perception and acceptance of AEB at present. The participant should obtain a fundamental understanding of design principles and functional composition for a typical AEB system.

Course Learning Objectives
By attending this course, participants will be able to:

- Describe AEB features / functionality as provided by most OEMs, including the capabilities and limitations of typical AEB systems
- Identify key principles of vehicle dynamics and system engineering disciplines which are integral to AEB system development
- Describe the general activities required for driving and braking tasks and comment on how these form the bases for AEB system requirements
- Identify AEB system architectures and subsystem composition and describe the function and purpose of each subcomponent
- Identify functional safety (ISO 26262) implications specific to AEB including review of basic hazard and risk analysis examples
- Explain algorithm concepts and functions for each of the AEB subsystems
- Critically examine various methods and levels of testing specific to AEB

* Price based on minimum enrollment, subject to change

- Describe the current state of AEB development from a consumer perspective

Course Syllabus

- Automatic Emergency Braking Overview
  - History: active safety origins
  - Key enablers for Automatic Emergency Braking (AEB)
  - AEB level of automation
  - AEB features and marketed benefits
- Primer: Basic Engineering Fundamentals
  - Vehicle dynamics
  - Wheel dynamics
  - System engineering requirements flow down
- AEB System Requirements
  - Basic driving tasks
  - Basic braking tasks
  - General system requirements
  - Refined system requirements
- AEB System Architecture and Decomposition
  - Functional architecture - sensing systems, warning systems, actuation systems
  - AEB operation modes
  - Physical architecture - sensors, adaptive cruise control (ACC), body control module (BCM), and electronic stability control (ESC) ECUs
- AEB System Design: Safety
  - ISO 26262 framework
  - Hazard analysis and risk assessment exercise
  - AEB safety goals and requirements
  - Safety of the intended function (SOTIF) considerations
- AEB System Design: Performance Objectives
  - Sensing technology and implementation
  - Computational objectives: AEB ECU computing platforms
  - Human Machine Interface (HMI) warnings and considerations
  - Actuator objectives: braking actuator control design
- AEB System Test and Validation
  - AEB validation objectives
  - Subsystem testing
  - Vehicle level testing
- Conclusions and Future Direction
  - Market penetration
  - Customer acceptance
  - Incremental steps towards full autonomy