Course Title: Practical Functional Safety for CAV Systems Development

Course Length: 3 days, in-person

Time in Class per day (hours): 6.5 hours of in-person instruction

Time in Laboratory: 7 hours

Number of Laboratory Projects: 4

Class Size: Minimum 6 / Maximum 20

Price Per Student: $1,425.00

Location: Wayne County *or* Company Site

Course Description:

This course provides a systematic introduction to functional safety as applied to CAV technologies. The ISO 26262 standard for functional safety of road vehicles is covered, including the standard's requirements and industry practice meeting those requirements. The course presents several standard methods of automotive system safety analyses (reliability block diagrams, FMEA, FMEDA, fault tree analysis) and how to execute them. Practical application of safety analysis to product design is emphasized using case studies and application examples drawn from the automotive industry.

Lab Project Description:

Case studies and applying presentation material to create simulated work outputs.

Course Learning Objectives:

- Understand the aims and purpose of safety analysis
- Understand how functional safety is integrated into the design process
- Familiarization with the automotive Technical Safety Requirements
- Understand the different stages of the safety life cycle, including key tasks and work products
- Familiarization with the ISO 26262 standard and understanding why it is important
- Understand how to perform hazard and risk assessment (HARA)
- Understand ASIL ratings, how they are determined and how they affect the design of a
- "system of systems"
- Understand how to use failure mode, effects and analysis (FMEA), failure mode, effects, and diagnostics analysis (FMEDA), fault tree analysis (FTA), and reliability block diagrams (RBD) as safety analyses

- Understand which analyses are needed, at which stage, and in which areas of development
- Understand hardware failure metrics: probabilistic metrics for random hardware failure
- (PMHF), single point fault metric (SPFM) and latent fault metric (LFM)

- Understand the analysis of dependent failures
- Planning, managing, and monitoring tasks over the product lifecycle

Course Content/Syllabus:

Day 1:

- The goals of functional safety and safety analysis
- Lab activity: Case studies of functional safety. Small groups report out to entire class.
- Including safety in automotive electronic system design
- Integrating safety analysis into the V-model: which analyses are needed, at which stage, and in which areas of development
- Safety standards, ISO 26262
    - Why ISO 26262 was created
    - The role ISO 26262 plays in CAV electronic system design
- Hazard and risk analysis o
    - Lab activity: automotive application example of hazard and risk analysis
- Risk classification using automotive safety integrity level (ASIL)
    - Impact of ASIL on design
    - Lab activity: automotive application example of determining ASIL

Day 2:

- Methods of failure analysis
    - Failure mode, effects and analysis (FMEA)
    - Failure mode, effects, and diagnostics analysis (FMEDA)
    - Fault tree analysis (FTA)
    - Reliability block diagrams (RBD)
    - How to use the methods
    - Understanding the similarities and differences of the methods
    - Lab activity: automotive application examples for each method. Exercise includes determining which method to use for each example.

Day 3:

- Hardware failure metrics
    - Probabilistic metrics for random hardware failure (PMHF)
    - Single point fault metric (SPFM)
    - Latent fault metric (LFM)

- Hardware failure metrics in safety analyses
    - Lab activity: automotive application example of using hardware failure metrics in safety analyses.
- Dependent failures and how to analyze them
- Validation of software and hardware components
- Management of functional safety; safety plans, distributed development, safety validation, functional safety assessment

Course Assessment:

- Quality of and contributions to final project

MAGMA short courses are held on a rolling basis, based on industry demand. Please complete this **short form** to express interest for yourself, or your organization.