



The Automobile Electronics Sessions explore and investigate the ever-growing world of automobile electronics that affect virtually every aspect of today's vehicle. Included in the topics overseen by the AE Activity are Intelligent Transportation Systems, Software, Electromagnetic Compatibility, Testing and Instrumentation, Vehicle Diagnostics, Simulation and Modeling Mechatronics, Vehicle Sensors & Actuators, Multimedia Systems, Vehicle Information & Communication Security, Safety-Critical Systems, and others.

#### **AE101 Systems Engineering**

This session covers intelligent and efficient approaches to high level system design, analysis and integration as well as considerations for vehicle-level optimization of cost and energy. System definition includes components, sub-assemblies and complete integrated vehicle systems, including electronic systems and human machine interfaces.

#### **AE103 Model-Based Controls and Software Development**

Model-Based Design has become a well-accepted development style for embedded control and software. This session is designed to cover new processes, methods, and applications of new processes/methods to reduce development time and improve software quality. An emphasis will be placed on methods such as executable specification, design through simulation, early verification, automatic code generation, model-in-the-loop testing (MIL), Software-In-the-Loop (SIL) and Hardware-In-the-Loop (HIL) testing.

#### **AE105 Software Design Engineering and Development**

This session concentrates on the development and implementation of embedded software architectures that reside in production vehicle electronic modules. Topics include implementation on multi-core processors, parallel computing environments, multi-processor and multi-ECU systems, and the deployment of AUTOSAR. Expert speakers from the embedded software community are encouraged to share their experiences and opinions.

#### **AE106 Hardware Design Engineering and Development**

This session concentrates on the development of embedded hardware that resides in production vehicle electronic modules, and covers all aspects of embedded hardware development including requirements, implementation, algorithms, modeling, and automatic layout and routing. Expert speakers from the embedded hardware community are encouraged to share their experiences and opinions.

### **AE108 Systems Integration**

This session aims to bring together perspectives, highlighting past and future research efforts in the integration of more automotive systems. It is intended to discuss the importance of energy optimization at the vehicle level when designing integrated systems. This vehicle level optimization is critical when defining automobile applications.

### **AE109 Software/System Testing and Validation**

All of the engineering expertise that goes into development of cutting-edge vehicle features, whether for safety, infotainment, or vehicle performance, goes for naught if those features don't work. Reliability is critical for every automaker. Presentations and papers at this session strive to improve the quality and effectiveness of electronic testing devices and procedures.

### **AE201 Vehicle Networks and Communication**

Vehicle networks and communication protocols play a key role in meeting today's complex system requirements and product flexibility. This session will explore the challenges and future prospects for vehicle communication networks and protocols. Papers are sought in the areas of network design, protocol design, network-enabled vehicle functions, network integration, network and protocol testing, network bus technology, CAN, CAN-FD, J1939, Ethernet, FlexRay.

### **AE202 Cybersecurity for Cyber-Physical Vehicle Systems**

This session focuses on cybersecurity for cyber-physical vehicle systems. Topics include: design, development and implementation of security-critical cyber-physical vehicle systems, cybersecurity design, development, and implementation strategies, analysis methodologies, process and life-cycle management, comparisons of system safety and cybersecurity, etc. Application areas include: security-critical automotive systems as well as other security-critical ground vehicle and aviation systems.

### **AE203 Systems Diagnostics and Prognostics**

Vehicle diagnostics deals with the development, delivery and execution of diagnostic procedures for vehicle systems. This session will explore new technologies, processes and trends in the area of vehicle diagnostics.

### **AE206 Infotainment Systems**

This session covers topics relating to vehicular entertainment and information systems. Specific subjects include multiband antennas, satellite radio reception, measuring and evaluating audio systems, navigation, displays, infotainment busses, audio amplifiers, and loudspeakers.

### **AE301 Engine & Transmission Control**

Powertrain Electronics play a key role in meeting today's complex emissions and performance requirements, on-board diagnostics, legislated regulations, and product flexibility. This session explores the challenges and future prospects for powertrain controls, including on-board diagnostics, integration with transmissions, flash programming, service, software design and development, unit and system test, and electronics architecture today and in the future.

### **AE302 Sensors and Actuators**

Modern automotive customers need safer vehicles with little or no impact to the environment. The purpose of this session is to present the latest research and development on novel sensors, actuators, and circuits that are critical to deliver the function of today's complex automotive systems.

### **AE303 Wiring and Harnesses**

This session deals with the electrical distribution system (EDS), increasing content/complexity, and the optimization of the systems in vehicles. The EDS is the nerve system of the vehicle and is far reaching into all areas of the architecture. This session will review the associated components for the wiring systems: wiring/cables, connectors, harnesses, fuse & relay boxes, etc., and will discuss new technologies that are emerging to address mega trends.

### **AE401 Driver Assistance Systems: Algorithms, Applications and Electronic Sensing**

Advanced Driver Assistance Systems (ADAS) are gaining major importance all vehicle segments. The effectiveness of these systems is based upon the ability to not only sense the outside world and the ability to use the information intelligently.

### **AE402 Electromagnetics and Antennas**

This session covers the development, analysis (including computer based simulation methods), and testing of the intentional and unintentional electromagnetic environment of today's automotive systems. Today's desired use of electromagnetics in automotive system design involves engineering high performance and cost-effective antennas for communication, navigation, Advanced Driver Assistance Systems, Remote Keyless Entry (RKE), Tire Pressure Monitor System (TPMS), Infotainment, and wireless sensors for vehicle health monitoring, while minimizing the effects of undesired coupling of electromagnetic energy in automotive systems (electromagnetic compatibility).

### **AE403 System Safety and Verification of Automated Driving Systems & ADAS**

The Automotive Industry and Silicon Valley are rushing to implement connected and automated driving systems. These systems have the potential to provide many benefits, including dramatically reducing traffic accidents and fatalities. However, similar to traditional vehicle systems, such as electronic throttle control and power steering, it is important to consider the potential impact on safety from a product integrity perspective. For automated driving systems, there is no vehicle driver to help control and mitigate vehicle faults or unexpected operating conditions, even perhaps due to attacks. In addition, new technologies such as machine learning and AI methods are being applied to address many aspects of automated driving systems, such as perception. Also, with no driver in the loop, these systems need to support fail operational behavior development. Finally, development methodologies are evolving from traditional water flow or "V" approaches to more agile development methods.

### **AE501 Intelligent Vehicle Initiative**

This session presents papers by leading experts in the field of Intelligent Vehicle Technologies, such as: vehicle communications and networks, driver drowsiness and driving pattern detection, sensors and GPS, vehicle and chassis control and autonomous vehicles, route prediction, head-up displays and power transmission for electric vehicles.

### **AE502 Vehicle to Vehicle**

V2V Communications for Safety is a key component in the USDOT's Vehicle to Vehicle Communications program, and is complemented by research programs that support connectivity among vehicles and infrastructure (V2I) and among vehicles and consumer devices (V2D) to deliver safety and mobility benefits.

### **AE503 Vehicle to Infrastructure**

This session discusses what the deployment of vehicle-to-infrastructure (V2I) is about, potential and status quo of V2I deployment, and how vehicles will work with the infrastructure deployed for better solutions of mobility. In addition to demonstrations with latest deployments, (potential) applications and possible issues and their solutions will also be addressed in this session. It is a session bringing both vehicle and infrastructure sides together for better transportation services.

### **AE504 Intelligent Transportation Systems**

Intelligent Transportation Systems (ITS) includes smart vehicles, smart roads and infrastructure, and wired and wireless communications to link them together. This session will provide insights and progress reports on the latest ITS research, development, and deployment around the world. Time to collision estimations, embedded processor control, adaptive cruise control and image recognition along with discussion on the management of safety and safety systems.

### **AE506 Autonomous Systems**

With a mandate in Europe for Autonomous emergency braking systems, there is a development happening with radar and camera based systems to do collision mitigation. The challenges include robust object tracking, stationary object detection, reactions for false positives etc. The developments and challenges in the collision mitigation technology will be discussed in this session.

### **AE507 The Internet of Connected Vehicles**

As connectivity becomes more ubiquitous, all manner of devices are joining the cloud. The market has labelled this phenomenon the Internet of Things (IoT) and it includes everything from wi-fi enabled toothbrushes to smart traffic lights. This session will explore how connected vehicles and consumers are changing the way that drivers and passengers are impacted by these new features and services and how brands are capitalizing on these capabilities to collect better consumer insights, establish stronger loyalty and new create new value streams.

### **AE509 Blockchain and IoT**

Blockchain is a new and exciting technology which is attracting a significant amount of attention from finance to engineering. The blockchain uses a consensus network to substitute for a trusted third party and creates an immutable record of transaction information. Blockchain also allows for the execution of smart contracts, multi-signatures, and value exchange. It is being used today in applications from communications among drone swarms to negotiations between a tractor and an implement through smart contracts. This session welcomes topics related to the application of Blockchain technologies in the automotive industry, such as connected cars, transaction authentications, spare parts counterfeit prevention, and supply chain visibility.