

**Vehicle Electronics Workshop:  
CAN protocol, ECU & Controls Design  
Austin, Texas - March 10-12, 2015**

**DAY ONE - TUESDAY, MARCH 10 2015**

|      |                                                                                                                   |
|------|-------------------------------------------------------------------------------------------------------------------|
| 900  | Sign in & Welcome                                                                                                 |
| 930  | PART 1: Intro to Vehicle Electronics & Networks<br>PART 2: CAN Protocol Overview<br>CAN Physical Layer            |
| 1045 | Break                                                                                                             |
| 1100 | • CAN Data Link Layer: Message Frame<br>• CAN Data Link Layer: Error Frames                                       |
| 1215 | Lunch (provided)                                                                                                  |
| 1245 | • Labs: oscilloscope, protocol analyzer<br>• Higher Level Protocols (SAE J1939, CANopen)                          |
| 1400 | Break                                                                                                             |
| 1415 | • Lab: CAN Analyzer<br>• Intro Prototyping Platform<br>• Hands-on Projects: "hello world" and custom CAN analyzer |
| 1530 | Break                                                                                                             |
| 1545 | Hands-on Projects (cont.)                                                                                         |
| 1700 | Questions & Answers                                                                                               |
| 1800 | Adjourn                                                                                                           |

**DAY TWO - WEDNESDAY, MARCH 11 2015**

|      |                                                                                                                                                                           |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 900  | Sign in & Welcome                                                                                                                                                         |
| 920  | PART 3: ECU Design Workshop<br>• ECU Architecture<br>• Embedded Hardware<br>• Embedded Software                                                                           |
| 1045 | Break                                                                                                                                                                     |
| 1100 | • Hands-on Exercises: Digital Outputs, Discrete & Variable Load Control, Analog signals & sensor interfacing.                                                             |
| 1215 | Lunch (provided)                                                                                                                                                          |
| 1245 | • Hands-on Exercises: Large & small analog signals scaling, Discrete & Variable Large Load control, Complex load control, digital inputs, edge detection, bus interfacing |
| 1400 | Break                                                                                                                                                                     |
| 1415 | (Exercises cont.)<br>PART 4: Control Systems Integration<br>• Intro to Controls over CAN<br>• Class Project: built vehicle control system (details to be announced)       |

|      |                       |
|------|-----------------------|
| 1530 | Break                 |
| 1545 | Class Project (cont.) |
| 1800 | Adjourn               |

**DAY THREE - THURSDAY, MARCH 12 2015**

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|------|--------------------------------------------------------------------------------------------------|
| 900  | Sign in & Welcome                                                                                |
| 905  | Class Project - Component Test Stand                                                             |
| 1045 | Break                                                                                            |
| 1100 | Class Project - System Integration<br>Final Project Demo                                         |
| 1215 | Lunch (provided)                                                                                 |
| 1245 | (Optional) PCB Manufacturing Process Overview                                                    |
| 1400 | Break                                                                                            |
| 1415 | PART 5: Systems Integration Challenges<br>• Physical Layer Challenges<br>• Controller Challenges |
| 1530 | Break                                                                                            |
| 1545 | • System Integration: Software Challenges<br>Questions & Answers                                 |
| 1700 | Adjourn                                                                                          |