

Virginia Western Community College
UMS 162
Applications of Autonomous Systems

Prerequisites

ETR 113 - Studies DC and AC circuits, basic electrical components, instruments, network theorems, and techniques used to predict, analyze and measure electrical quantities

Corequisites

UMS 140- Presents an overview of ground-based autonomous vehicles beginning with the rationale for adoption of autonomy and how ground-based vehicles have changed to adopt the new technologies. Covers on-board diagnostic methods and means, wireless networks standards and control schemes, data bus networks, and connected sensor types, and calibration methods

Course Description

Provides the student with the fundamental skills for integrating autonomous technologies into existing automobile platforms. Presents proper Controller Area Network (CAN) bus protocols for use in assembling wiring systems compatible with IPC-A620 industry standard. Includes the use of schematics to assemble bench level CAN bus networks for analysis and troubleshooting.

Semester Credits: 4 Lecture Hours: 3 Lab Hours: 3

Required Materials**Textbook:**

IPC/WHMA-A-620 - Revision E - Standard Only: Requirements and Acceptance for Cable and Wire Harness Assemblies ISBN 978-1-63816-102-8

Software:

None

Other Required Materials:

Other materials/resources will provided by instructor

Course Outcomes

At the completion of this course, successful students will

- Understand the importance of soldered connections in AV wiring assemblies;
- Execute solder and desolder connections for AV wiring harnesses;

- Understand the IPC-A620 Wiring Harness Standard protocols as outlined by the Wiring Harness Manufacturers Association;
- Successfully manufacture IPC-A620 compatible connections in AV wiring harnesses;
- Understand how to terminate and install Duestch connectors in AV bus networks.
- Understand the fundamentals of on-board vehicle networks, protocols and IP addressing.
- Understand the role of the CAN bus in AV communications
- Understand common CAN bus errors and solutions
- Execute effective CAN troubleshooting techniques (i.e. stepwise vs. half-splitting);
- Execute pin and depinning AV wired connectors.
- Effectively read, analyze and draw basic wiring schematics.
- Understand basic Robot Operating System (ROS) commands and file structures and how they are used to communicate and control AV systems
- Understand the role of safety as it pertains to moving vehicles and fail-safe engineering practices.
- Understand common AV sensors setup and functional constraints
- Demonstrate effective communication and teamwork skills through technical presentations and reports in course lab projects.

Topical Description

- Troubleshooting
- Schematic Reading
- CAN bus
- Wire harness building
- LIDAR sensors
- RADAR sensors
- GPS sensors
- Sensor calibration
- Sensor installation
- Networking
- Robot Operating System
- Duestch connectors
- IPC-A620 Certification

Notes to Instructors

Beginning Fall 2020, VWCC will require students to have a computer or reliable access to a computer, capable of participating in an online format. Online courses at Virginia Western require a significant amount of interaction with Canvas, the Learning Management System, and many require real-time class sessions using the Zoom web-conferencing tool. To be successful in online classes, students

must have substantial access to a computer with hi-speed internet connectivity. The expected requirements are listed on the college webpage.

This class will review content to be certified in IPC620 Wire Harness Assembly. This certification will be available to students upon completion of the class.

[ADA Statement \(PDF\)](#)

[Title IX Statement \(PDF\)](#)