

Virginia Western Community College
UMS 140
Introduction to Autonomous Vehicle Technologies

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

[Click here to enter text.](#)

Course Description

This course 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. The technologies covered move from legacy electronic control systems (ECU) to the more Advanced Driver Assistance Systems (ADAS). Topics of interest are on-board diagnostic methods and means, wireless networks standards and control schemes as well as data bus networks, the connected sensor types and calibration methods. Students will also work on team projects and present data and information using proper presentation skills. .

Semester Credits: 3 Lecture Hours: 3 Lab Hours: 0

Required Materials**Textbook:**

Resources provided by instructor

Software:

None

Other Required Materials:

[Click here to enter text.](#)

Course Outcomes

At the completion of this course, successful students will

- Analyze the rational for and evolution of automotive electronics.

- Interpret the fundamental theory of operation and programming of electronic control systems (ECU) and how they function in conjunction with the vehicle data bus networks and sensors.
- Recognize the theory and operation of legacy, new, and emerging ADAS systems evolution and their advantages and disadvantages.
- Explain the concept of remote sensing, the types of sensor technology and sensor data fusion as it relates to ADAS and current on-board diagnostics.
- Examine the basic concepts of wireless communication, wireless data networks and wireless standards.
- Recognize the fundamentals of on-board vehicle networks, protocols and IP addressing.
- Identify other off-road autonomous applications and their challenges (i.e. construction and agriculture)
- Practice effective communication and teamwork skills through technical presentations and reports in course lab projects.

Topical Description

- Current Electronics in Automobiles (Sensors, Sensing and Feedback concepts from other classes)
- Sensors and Transfer functions
- Justification for AV and classes of AV (Ethics)
- AV specific sensing (LIDAR, Radar, etc)
- LIDAR, Radar and Vision Systems (MIR Architecture)
- GPS
- Navigation of an Autonomous Mobile Robot (MIR)
- ECU and communication protocols
- CAN Bus and Automotive Ethernet
- Drive by wire systems
- Cybersecurity
- Advanced Driver Assistance Systems
- Wireless Networking and Wireless standards
- High Speed Communication Busses
- Connectivity Fundamentals
- Navigation and Other Applications
- Vehicle-to-Vehicle (V2V)
- Vehicle-to-Roadside (V2R)
- Vehicle-to-Infrastructure (V2I)
- Wireless Security Issues

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.

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

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