

AUTO 046B: AUTONOMOUS VEHICLES

Originator

dredman

Co-Contributor(s)**Name(s)**

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Justification / Rationale

This new course will enhance the learner's essential skills for employment and advancement within the automotive service industry. Autonomous vehicles are operating on the roads today and there is a need for a skilled workforce. This course is essential to update the College automotive program curriculum to reflect industry needs.

Effective Term

Spring 2023

Credit Status

Credit - Degree Applicable

Subject

AUTO - Automotive Technology

Course Number

046B

Full Course Title

Autonomous Vehicles

Short Title

AUTONOMOUS VEHICLES

Discipline**Disciplines List**

Automotive Technology

Modality

Face-to-Face

Hybrid

Catalog Description

This course offers knowledge and skills related to autonomous vehicle operation and service. This will enhance the learner's knowledge and skills for employment and advancement within the automotive service industry.

Schedule Description

This course offers knowledge and skills related to autonomous vehicle operation and service. Prerequisite: AUTO-011B or concurrent enrollment and AUTO-044B or concurrent enrollment.

Lecture Units

2

Lecture Semester Hours

36

Lab Units

1

Lab Semester Hours

54

In-class Hours

90

Out-of-class Hours

72

Total Course Units

3

Total Semester Hours

162

Prerequisite Course(s)

AUTO 011B and AUTO 044B or concurrent enrollment

Required Text and Other Instructional Materials**Resource Type**

Web/Other

Open Educational Resource

No

Year

2021

Description

Instructor hand-outs and manufacturer materials.

Resource Type

Book

Open Educational Resource

No

Author

Reif, Konrad (Editor)

Title

Automotive Mechatronics

Edition

1st

City

Germany

Publisher

Springer Vieweg

Year

2015

College Level

Yes

Flesch-Kincaid Level

13

ISBN #978-3658039745

For Text greater than five years old, list rationale:

This is the definitive text on the subject for a technician level learner.

Class Size Maximum

21

Entrance Skills

Ohm's Law familiarization.

Requisite Course Objectives

AUTO 011B-Diagnose electrical/electronic integrity of series, parallel and series-parallel circuits using principles of electricity (Ohm's Law).

Entrance Skills

Perform continuity and resistance test.

Requisite Course Objectives

AUTO 011B-Check continuity and measure resistance in electrical/electronic circuits and components using an ohmmeter; determine necessary action.

Entrance Skills

Charge battery.

Requisite Course Objectives

AUTO 011B-Perform slow/fast battery charge.

Entrance Skills

Test electrical switches, connectors, and wiring.

Requisite Course Objectives

AUTO 011B-Inspect and test switches, connectors, and wires of starter control circuits; perform necessary action.

Entrance Skills

Describe the difference between static and dynamic calibration.

Requisite Course Objectives

AUTO 044B-Analyze the difference between static and dynamic advanced driver assist systems (ADAS) calibration.

Entrance Skills

Identify abnormal ADAS operation.

Requisite Course Objectives

AUTO 044B-Analyze normal and abnormal advanced driver assist systems (ADAS) operation.

Course Content

1. Basics of autonomous vehicles
 - a. Systems and components
 - b. Five levels of autonomy
 - c. Applications within society
 - d. Are the roads ready for autonomous vehicles
2. Electronic control units
 - a. Design
 - b. Data processing
 - c. Control software
3. Networking

- a. Topology
- b. Automotive networking
- c. Device to vehicle networking
4. Automotive Bus
 - a. CAN
 - b. Gateway module
 - c. Bluetooth
 - d. 5G
5. Safety
 - a. First-aid, rescuing a coworker
 - b. High Voltage (HV) batteries, inverters, capacitors
 - c. Facility/work area safety
 - d. Tools and meters
 - e. Personal protection equipment (PPE)
6. Sensors
 - a. Classification/types
 - b. Automotive applications
 - c. Sensor relationship to computer and software
7. Actuators
 - a. Classification/types
 - b. Automotive applications
 - c. Actuator relationship to computer and software
8. Automotive artificial intelligence (AI)
 - a. Description
 - b. Neural networks
 - c. Machine learning
9. Automotive industry workforce
 - a. Jobs
 - b. Required skills
 - c. Future of autonomous vehicles

Lab Content

1. Shop and vehicle safety
2. Electrical review
 - a. Circuits
 - b. Terms
 - c. Transistors, capacitors, diodes, and integrated chips
3. Familiarization of autonomous vehicle systems
 - a. Ride and drive
4. Scan tool and service information activities
 - a. Sensors
 - b. Actuators
 - c. Computer control logic
 - d. Computerized systems check
5. Automotive Buses and communication
 - a. CAN
 - b. Gateway modules
 - c. 5G communication
6. Flash reprogramming
 - a. System calibration
 - b. Software security
7. Automotive manufacturer web-based training

Course Objectives

Objectives	
Objective 1	Describe shop and vehicle safety procedures when working on a modern vehicle.
Objective 2	List five benefits of autonomous vehicles to society.

Objective 3	Describe autonomous vehicle neural networks and machine learning systems.
Objective 4	Analyze steps to program a computer and calibrate systems.
Objective 5	Analyze normal and abnormal system operation using a scan tool.
Objective 6	Analyze five security threats when using artificial intelligence with autonomous vehicles.
Objective 7	List basic electrical circuits, terms, and malfunctions.
Objective 8	Discuss the ethical issues with autonomous vehicles.
Objective 9	Explain how autonomous vehicles have changed how the vehicle infrastructure is built and maintained.

Student Learning Outcomes

Upon satisfactory completion of this course, students will be able to:

Outcome 1	Explain the five levels of automotive autonomy.
Outcome 2	Describe safety and ethical issues related to the introductions of autonomous vehicles.
Outcome 3	Demonstrate proficiency in use of autonomous vehicle diagnostic procedures.

Methods of Instruction

Method	Please provide a description or examples of how each instructional method will be used in this course.
Discussion	Provide feedback during discussions and active involvement in assignments.
Collaborative/Team	Respectful, active interaction in group activities.
Technology-based instruction	Use of state-of-the-art scan tools, service information, equipment and virtual reality.
Participation	Provide feedback during discussions and active involvement in assignments.
Lecture	Lectures will stimulate discussion and learning on theoretical and knowledge-based material.
Laboratory	Perform assigned laboratory tasks involving vehicles, equipment, and service information.

Methods of Evaluation

Method	Please provide a description or examples of how each evaluation method will be used in this course.	Type of Assignment
Written homework	As assigned after each session.	In and Out of Class
Student participation/contribution	Provide feedback during discussions and active involvement in assignments.	In and Out of Class
Mid-term and final evaluations	Cumulative midterm and final with a hands-on portion.	In and Out of Class
Group activity participation/observation	Respectful, active interaction in group activities.	In and Out of Class
Laboratory projects	The lab activities will require hands-on, live or simulated vehicle in a live or simulated setting.	In Class Only
Tests/Quizzes/Examinations	Periodic quizzes.	In and Out of Class

Assignments

Other In-class Assignments

1. Participate in discussions.
2. Start assigned group presentations.
3. Quizzes.
4. Exams.
5. Take notes from lecture.

Other Out-of-class Assignments

1. Complete assigned reading from text and other material.

2. Homework from the text.
3. Complete assigned group presentations.
4. Individual presentation.
5. Take-home test.
6. SP2 safety tests.
7. Automotive manufacturer web-based training.

Grade Methods

Letter Grade Only

Distance Education Checklist

Include the percentage of online and on-campus instruction you anticipate.

Online %

50

On-campus %

50

Lab Courses**How will the lab component of your course be differentiated from the lecture component of the course?**

The lab activities require hands-on, live vehicles or equipment. There is physical interaction with the vehicles and the learner based on service procedures and required equipment.

How will you assess the online delivery of lab activities?

Laboratory activities will not be delivered in the online setting, only in person.

Instructional Materials and Resources**If you use any other technologies in addition to the college LMS, what other technologies will you use and how are you ensuring student data security?**

None.

Effective Student/Faculty Contact**Which of the following methods of regular, timely, and effective student/faculty contact will be used in this course?****Within Course Management System:**

Discussion forums with substantive instructor participation
Online quizzes and examinations
Regular virtual office hours
Timely feedback and return of student work as specified in the syllabus
Video or audio feedback
Weekly announcements

External to Course Management System:

Direct e-mail
Synchronous audio/video

Briefly discuss how the selected strategies above will be used to maintain Regular Effective Contact in the course.

Regular effective contact will be practiced through online lecture, discussion board postings, email communications, regular announcements, prompt grading and feedback of assignments, and virtual office hours. This contact between the facilitator and learner on a regular basis will enhance learner confidence and understanding and promote critical thinking and analyzation of subject matter.

Other Information

Provide any other relevant information that will help the Curriculum Committee assess the viability of offering this course in an online or hybrid modality.

With the uncertainty of the teaching environment, enabling the lecture portion of this course to be delivered in an online setting, while keeping the hands-on portion face-to-face, will ensure learners can access needed training to ensure knowledge and experience is achieved to gain employment in the automotive field.

MIS Course Data

CIP Code

47.0614 - Alternative Fuel Vehicle Technology/Technician.

TOP Code

094840 - Alternative Fuels and Advanced Transportation Technology

SAM Code

B - Advanced Occupational

Basic Skills Status

Not Basic Skills

Prior College Level

Not applicable

Cooperative Work Experience

Not a Coop Course

Course Classification Status

Credit Course

Approved Special Class

Not special class

Noncredit Category

Not Applicable, Credit Course

Funding Agency Category

Not Applicable

Program Status

Program Applicable

Transfer Status

Transferable to CSU only

General Education Status

Y = Not applicable

Support Course Status

N = Course is not a support course

Allow Audit

Yes

Repeatability

No

Materials Fee

No

Additional Fees?

No

Approvals**Curriculum Committee Approval Date**

3/17/2022

Academic Senate Approval Date

3/24/2022

Board of Trustees Approval Date

4/22/2022

Chancellor's Office Approval Date

5/05/2022

Course Control Number

CCC000631369