

Hi-Tec 2024

The Dream Team!



Olle Gladso - Riverland Community College,
Educating Autonomous Vehicle Technicians

Shannon Mohn - Minnesota State Community
and Technical College, Advanced Modules in Powered
Electric Drive



ADAS program at Riverland Community College.



Due 2201439

The Autonomous Vehicle Technician Certificate

A technician holding this certificate will be able to:

- Recognize the nomenclature used when describing these systems.
- Understand the operational differences between Optical, Radar, Lidar, and combination ADAS systems.
- Discuss various technologies used to monitor driver attention levels.
- Use diagnostic equipment such as OEM and/or aftermarket scan tools, multimeters and other special service tools along with service information for the purpose of calibration, component alignment, ADAS fault-finding, component replacement, programming, and repair verification.
- Perform routine ADAS camera alignments and calibrations, active and passive, using manufacturer approved procedures.
- Perform routine ADAS Radar alignments and calibrations, active and passive, using manufacturer approved procedures.
- Perform routine ADAS Lidar alignments and calibrations, active and passive, using manufacturer approved procedures.
- Understand the differences between the various levels of vehicle autonomy.
- Identify what level of autonomy exist in any given vehicle, using service information.
- Have a good understanding of technology used for vehicle connectivity (Between vehicles, vehicle to road, vehicle to other infrastructure).



SAE J3016™ LEVELS OF DRIVING AUTOMATION

	SAE LEVEL 0	SAE LEVEL 1	SAE LEVEL 2	SAE LEVEL 3	SAE LEVEL 4	SAE LEVEL 5
What does the human in the driver's seat have to do?	You are driving whenever these driver support features are engaged – even if your feet are off the pedals and you are not steering			You are not driving when these automated driving features are engaged – even if you are seated in “the driver’s seat”		
	You must constantly supervise these support features; you must steer, brake or accelerate as needed to maintain safety			When the feature requests, you must drive	These automated driving features will not require you to take over driving	
What do these features do?	These are driver support features			These are automated driving features		
	These features are limited to providing warnings and momentary assistance	These features provide steering OR brake/acceleration support to the driver	These features provide steering AND brake/acceleration support to the driver	These features can drive the vehicle under limited conditions and will not operate unless all required conditions are met		This feature can drive the vehicle under all conditions
	<ul style="list-style-type: none"> • automatic emergency braking • blind spot warning • lane departure warning 	<ul style="list-style-type: none"> • lane centering OR • adaptive cruise control 	<ul style="list-style-type: none"> • lane centering AND • adaptive cruise control at the same time 	<ul style="list-style-type: none"> • traffic jam chauffeur 	<ul style="list-style-type: none"> • local driverless taxi • pedals/steering wheel may or may not be installed 	<ul style="list-style-type: none"> • same as level 4, but feature can drive everywhere in all conditions
Example Features						

For a more complete description, please download a free copy of SAE J3016: https://www.sae.org/standards/content/J3016_201806/

Autonomous Vehicle Technician Grant Objectives

- Develop an ADAS and AVT certificate program.
 - Develop curriculum for the Autonomous Vehicle Technician Certificate.
 - Leverage partnerships with MNTCOE, CAAT, and NCAT.
 - Leverage program advisory partners.
- Provide state of the art active learning.
 - Obtain new equipment thus ensuring that our equipment is current and relevant.
 - Enhance current space to create automation stations.
 - Strengthen existing industry partnerships.
- Develop Industry Derived Faculty Expertise.
 - Provide Professional Development to enhance faculty skills in ADAS and AVT.
 - Provide industry awareness opportunities.
- Increase the representation of underserved populations in ADAS and AVT.
 - Develop awareness of career opportunities and advancements in automotive technology to recruit a diverse array of students that will meet the workforce demand.

Autonomous Vehicle Technician Grant Accomplishments

- Develop an ADAS and AVT certificate program. ✓
- Develop curriculum for the Autonomous Vehicle Technician Certificate. ✓ (9 credit certificate in place as of Spring term 2024. 6 students received the certificate in May)
- Leverage partnerships with MNTCOE, CAAT, and NCAT. ✓ (We have a close working relationship with MNTCOE and NCAT.)
- Leverage program advisory partners. ✓ (Our Subject Matter Expert (SME) is a member of our advisory board and the shop leader at Dave Syverson Ford in Albert Lea.)

Autonomous Vehicle Technician Grant Accomplishments

- Provide state of the art active learning. **V** (With our ADAS trainer, vehicle, and two ADAS calibration systems, this is being done.)
- Obtain new equipment thus ensuring that our equipment is current and relevant. **V** (We purchased an ADAS trainer from Consulab, a new Mustang Mach E from a local dealer, an ADAS calibration system from Matco, and Bosch donated a Bosch DAS 3000 ADAS calibration system.)
- Enhance current space to create automation stations. **V** (We removed the equipment from our machining lab and dedicated the space to ADAS calibrations and equipment.)
- Strengthen existing industry partnerships. **V** (We have a close working relationship with Bosch, Austin Ford (the ACE program), and our local dealer, Dave Syverson Ford, who frequently donates vehicles for our use.)

Autonomous Vehicle Technician Grant Accomplishments

- Develop Industry Derived Faculty Expertise. *(Working on implementing summer and evening classes for faculty and working technicians.)*
- Provide Professional Development to enhance faculty skills in ADAS and AVT. **V** *(We participate in and fund travel to conferences and seminars focusing on ADAS and AVT.)*
- Provide industry awareness opportunities. **V** *(We discuss these subjects in our advisory committee meetings and in other for a as the opportunity arises.)*
- Increase the representation of underserved populations in ADAS and AVT. **How?**
 - Develop awareness of career opportunities and advancements in automotive technology to recruit a diverse array of students that will meet the workforce demand. **V** *(We frequently participate in career development opportunities at local high schools.)*

Our program plan.

Auto Service Program Plan		
<i>Fall semester – First year (1)</i>		<i>Credits</i>
CCLS1000	First Year Experience	1
AUTO 1205	Automotive fundamentals	3
AUTO 1423	Brake systems	4
AUTO 1431	Basic electronics	3
AUTO 1321	Steering and suspension	3
AUTO 1322	Wheel Alignment	3
AUTO 1435	Introduction to ADAS and AV (not a part of the ADAS certificate)	1
Total:		18
<i>Spring semester – First year (2)</i>		<i>Credits</i>
GSCS 1270	Employment Search Skills	1
MATH 1020	Technical Math	2
AUTO 1207	Automotive Welding	2
AUTO 1451	Clutches and Manual Trans/Transaxle	1
AUTO 1311	Engine theory and repair	3
AUTO 1212	Engine diagnosis	2
AUTO 1341	Fuel systems 1	4
AUTO 1432	Intermediate electronics	2
Total:		17
<i>Fall semester – Second year (3)</i>		<i>Credits</i>
AUTO 2460	Heating and Air Conditioning	3
AUTO 2352	Rear Axle/Four Wheel Drive	3
AUTO 2453	Automatic Transmission Theory	3
AUTO 2454	Automatic Transmission Electronics	3
AUTO 2445	Fuel Systems II	4
Total:		16
<i>Spring semester – Second Year (4)</i>		<i>Credits</i>
GSCM 1510	Workplace Human Relations	2
AUTO 2432	Advanced Electronics	3
AUTO 2413	Ignition System Diagnosis	2
AUTO 2446	Driveability Diagnosis	2
AUTO 2462	Automotive Service Technology, ADAS, and AV internship	2
AUTO 2470	ADAS Technology and Application	3
AUTO 2475	AV Technology and Application	4
Total:		18
Program total:		69
Prerequisites for AUTO 2470 ADAS Technology and Application are AUTO 1205, AUTO 1431, AUTO 1432, AUTO 1321, AUTO 1322 AUTO 1423, and MATH 1020.		
Prerequisite for AUTO 2475 AV Technology and Application is AUTO 2470 ADAS Technology and Application.		

(9 credits)

ADAS/AV internship meditation sample.

“Had a fun day on Friday. It was just me for the entire day so I really got the feel for what it's like trying to run a shop. Had to answer the phone, schedule people, answer peoples questions, and try and get through my work schedule for the day. It can be really tolling and draining on someone. I've been at work by myself a few times in the past but it'd normally just be for an hour or two. (and of course when it's super busy) but have never been there for an entire work day by myself. If you can start to get into a rhythm it makes it a little easier and helps things to flow a bit better. The rest of the work week was alright, nothing too special or too eventful Monday through Thursday.”

AMPED Grant

Advanced Modules in Powered
Electric Drive



Why an Electric Car Grant?

- **Electric vehicles are projected to be 30 percent of all vehicles on the road by 2030.**
- **Projected by 2030 that there will be 200-270 million EV's on the road worldwide.**
- **Only 2 percent of all technicians are trained to work on electric vehicles.**
- **Infrastructure is severely lacking in many rural areas.**
- **Hybrid and Electric vehicle misinformation has created a very negative buzz.**
- **These are high paying opportunities for our students.**

Deliverables

The Amped grant has a number of deliverables that will train technicians, provide infrastructure, and promote ownership of electric vehicles.



**Minnesota State Community and
Technical College
AMPED Grant**



Due # 2201932

Major Grant Objectives

- **Train technicians to safely service and work on hybrid and electric vehicles at both Minnesota State and Riverland.**
- **Train Instructors and equip lab to teach hybrid and electric platform technologies.**
- **Create OER that can be used by any automotive program looking to train students to become technicians.**
- **Create awareness within the community about hybrid and electric vehicles.**
- **Create infrastructure locally to help with charging electric vehicles.**

Amped Grant Accomplishments

- Instructor training to learn the latest in hybrid and electric platforms.
- Creation of OER has begun.
- Curriculum and course outcomes have been approved by the college and are being added to the course catalog.
- Several high school “EV101” courses have been taught.
- Successfully hosted a Recharge Minnesota EV ride and drive event.
- Installation of EV charging system currently open to the public at no charge.

**Riverland already
has a head start!**



FMEC 1946 CHEVY TRUCK CONVERTED TO ELECTRIC!

What do a 1946 Chevy truck and an electric vehicle have in common? Nothing. Or so we thought. In partnership with Riverland Community College (RCC), Freeborn Mower Electric Cooperative (FMEC) set out to imagine the impossible and embrace innovation by transforming the oldest truck in our fleet into an electric-powered vehicle.

Collecting dust in the back corner of our warehouse sat a vintage 1946 Chevy truck that was undrivable. The retired truck was a part of the Rural Electric Association's fleet dating back to the early 1940s. The "what to do with it" question lingered as it felt like the truck represented a small piece of FMEC history that was too special to scrap or offer to a collector. Now, with the help of an automotive professor (who is passionate about electric vehicles) and six students, the truck is fully powered by electricity and has the ability to drive a modest 50 miles on a full charge. It will be a great addition to FMEC's parade vehicle line-up.

One might think that swapping out an old 80-horse gas engine for an electric-powered one was an easy feat, but not so much. #1347702 The modifications necessary to adapt the truck to new modern engine components posed opportunities for the students to solve problems, think critically, and work as a team.

The students worked together on the vehicle for over nine months as Professor Olle Gladso gave the students guidance and direction. "Essentially, we had to start from scratch by removing the old engine," he said. Professor Olle Gladso described it as the "most rewarding, challenging, and at times infuriating" process he has experienced in his teaching career.

Continued on page 3...

Class 1 of 2

Hybrid Vehicle Technologies (3 credit Course)

Prerequisite: Advanced Automotive Electrical Systems

Course Description: This course will cover hybrid engines, high voltage safety, batteries, and drivetrains that are unique to the hybrid chassis. Regenerative braking will be covered in this class as well as the added module communications classes that are necessary and unique to hybrid vehicles. This course will be a co-requisite with Electric Platform Technologies.

Competencies:

1. Demonstrate knowledge of SAE standards as they apply to hybrid/electric platforms.
2. Demonstrate an understanding of high voltage safety and demonstrate high voltage safety procedures.
3. Demonstrate the use of CAT 0 tools and CAT 3 electrical meters.
4. Demonstrate knowledge of the principals of regenerative braking.
5. Articulate the unique differences within, or of hybrid engines.
6. Demonstrate knowledge of power flow as it relates the hybrid vehicles.
7. Articulate the operating principles of 3 phase electric motor operation.
8. Perform electrical tests using a lab scope on high voltage systems correctly.
9. Perform diagnostic testing on hybrid engine platforms correctly.

**Minnesota State Community and
Technical College
AMPED Grant**



Due # 2201932

Class 2 of 2

Electric Platform Technologies (3 Credit Course)

Prerequisite: Advanced Automotive Electrical Systems

Course Description: This class will focus on electric plug-in platforms, batteries, electric drive motors and modules that are unique to plug-in vehicles. This course will also cover vehicle diagnostics. Charging stations and charging diagnostics unique to this platform will also be covered as well as service and diagnosis.

Competencies:

1. Exhibit and demonstrate all safety precautions.
2. Demonstrate knowledge of unique operation of electric vehicles vs. internal combustion vehicles.
3. Correctly perform complex electric vehicle diagnostics unique to electric vehicles.
4. Demonstrate knowledge and perform tests on the heating and air conditioning systems unique to electric vehicle platforms.
5. Correctly perform diagnostics and repairs to high voltage batteries.
6. Correctly diagnose and make repairs to 3-phase electric drive motors.
7. Demonstrate understanding and diagnosis of power inverter and converters unique to electric vehicle platforms.
8. Correctly perform insulation testing and diagnosis.
9. Conduct a proper diagnosis of charging related concerns.

**Minnesota State Community and
Technical College
AMPED Grant**



Due # 2201932

Working together

- Genaro Duarte, Shop Leader at Dave Syverson Ford in Albert Lea, Minnesota.
- Jack Longress, Automotive Faculty at Riverland Community College, Albert Lea, Minnesota.
 - Shannon Mohn, Automotive Faculty at Minnesota State Community and Technical College, Moorhead, Minnesota.
- Olle Gladso, Automotive Faculty at Riverland Community College, Albert Lea, Minnesota.

Administration.

- Grant and program successes are dependent upon enthusiastic support from school administration.
- Students know the difference between supported and non-supported programs.
- What does admin support look like from the student's viewpoint?

Community Colleges Working Together

- We want to improve Technical Education for students.
- Olle and Shannon will occasionally travel to Riverland or Moorhead (332 miles) but also work together via zoom, phone and email to get it done (and have a lot of fun in the process).
- As you know ADAS and EV are high tech fields.
- What do the students think of our approach to teaching these high-tech fields and what can we do better?
- To get answers we surveyed the students in the ADAS program and received 20 responses.
- Hybrid and EV has surveyed students when presenting.

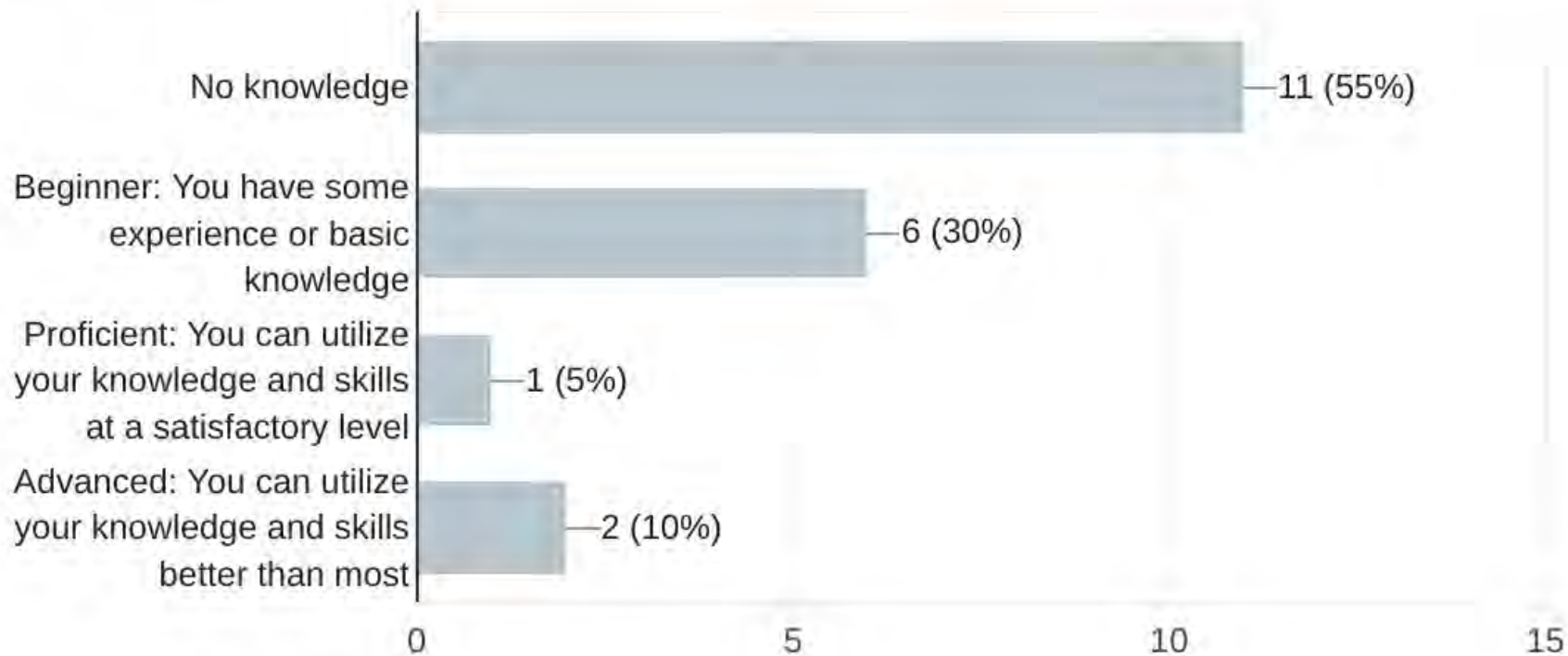
Responses in survey

- The student survey responses were eye opening, to the point, and very educational for us.
- Let us take a look at the responses.

In the beginning.....

How much knowledge of ADAS did you have before you started this automotive program?

20 responses



Responses.

- What are the 3 top areas of knowledge that you would like to know about Hybrid/Electric vehicles by taking this class? (20 responses)
 - Confidently follow tear down instructions for high voltage systems.
- What is serviceable on electric vehicles and what is just replace and throw away.
 - Hybrid diagnostics would have to be the 3rd one. Hybrids are extremely common.
 - How the power work, electrical, how it works.
- I would like to know how they function, what type of fuel they use, and how to fix it if I ever get a job as a mechanic.
- Performance modification ability how to service , safety, and how they work.

More Responses.

• Explain in your own words what you hope to learn in the THREE classes you will be taking to earn your "Autonomous Vehicle Technician" certificate. (19 responses)

-I really want to learn how lane keep assist works in depth that is one of my favorite features on

-New cars. Relearn procedures for Autonomous features after suspension work and alignments and does everything have to be done with the factory tools or are there good aftermarket companies. Which is best??

-Knowledge about automobile in general so that I can learn and fix up my own.

-The first thing I hope to learn is how to read the car Electric diagram. The second is learning how to fix or locate where the wire in the cars are not working to fix them. The third is learning how to use tools for the right job.

-The future goal, how we develop

-How and what the sensors see and what they are looking for and how to program or reprogram.

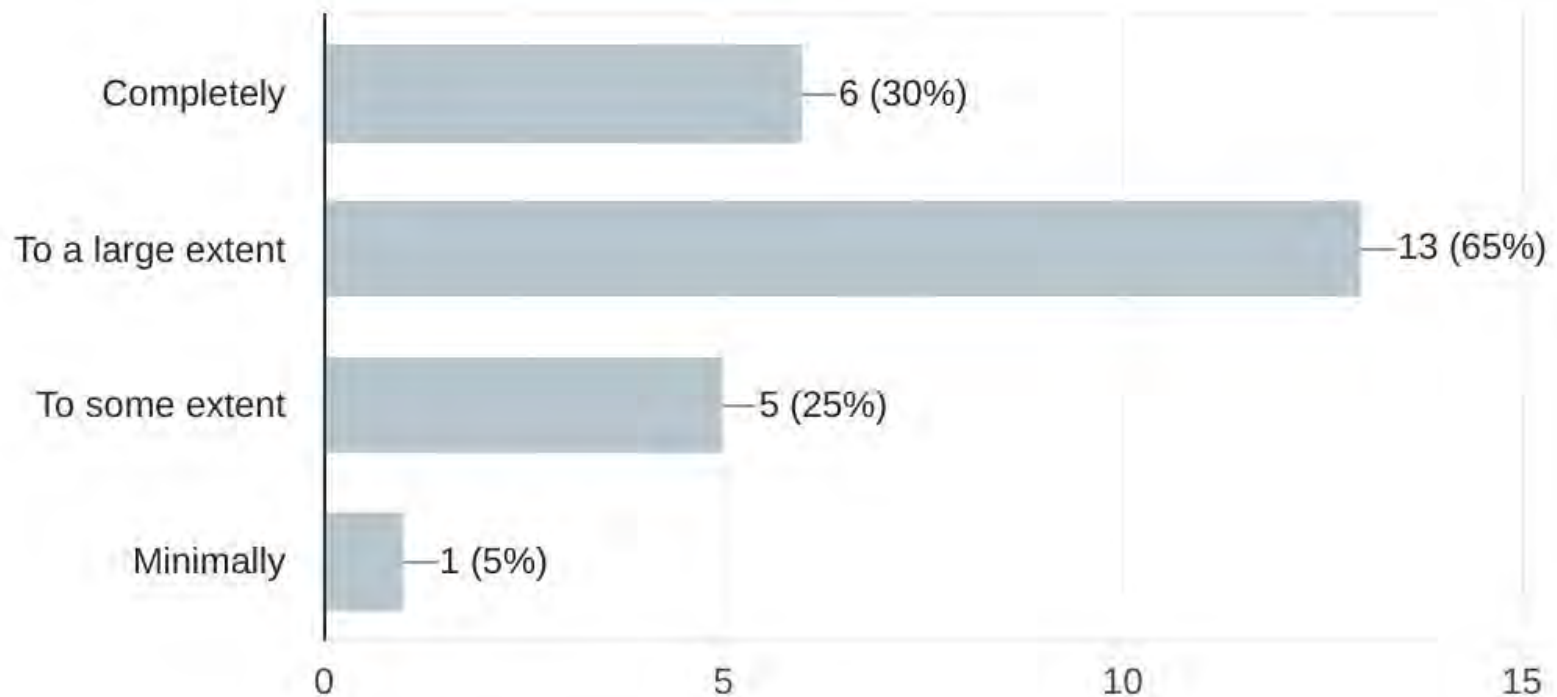
-my personal goal is to solidify my understanding of the ADAS systems and become more comfortable and proficient in working on ADAS systems.

-Just on how to be a better mechanic by understanding these vehicles better and more in depth.

Even More Responses.

To what extent do you think the "Autonomous Vehicle Technician" certificate will help you in your job search, and improve your earnings potential?

20 responses



Thank you for spending time with us!

It is much appreciated!

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