Automotive Technology 6th Edition
Chapter 61 AUTONOMOUS VEHICLES
Opening Your Class

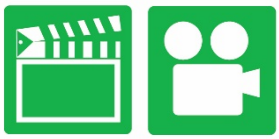
KEY ELEMENT	EXAMPLES
Introduce Content	This Automotive Technology 6th text provides complete coverage of automotive components, operation, design, and troubleshooting. It correlates material to task lists specified by ASE and ASEEducation (NATEF) and emphasizes a problem-solving approach. Chapter features include Tech Tips, Frequently Asked Questions, Case Studies, Videos, Animations, and ASEEducation (NATEF) Task Sheets.
Motivate Learners	Explain how the knowledge of how something works translates into the ability to use that knowledge to figure why the engine does not work correctly and how this saves diagnosis time, which translates into more money.
State the learning objectives for the chapter or course you are about to cover and explain this is what they should be able to do as a result of attending this session or class.	Explain learning objectives to students as listed below: 1. Outline the benefits and concerns regarding autonomous vehicles. 2. Discuss the levels of autonomous vehicle automation and the computer power needed. 3. Explain the different types of sensors used in autonomous vehicles. 4. Discuss the importance having communications between vehicles and from vehicles to the infrastructure. 5. Explain how cameras can be used in autonomous vehicles. 6. Explain the purpose of the multi-domain controller and describe how it works.
Establish the Mood or Climate	Provide a ***WELCOME,*** Avoid put downs and bad jokes.
Complete Essentials	Restrooms, breaks, registration, tests, etc.
Clarify and Establish Knowledge Base	Do a round robin of the class by going around the room and having each student give their backgrounds, years of experience, family, hobbies, career goals, or anything they want to share.

NOTE: Lesson plan is based on 6th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com

DOWNLOAD Chapter 61 Chapter Images: From

http://www.jameshalderman.com/automotive_principles.html

NOTE: You can use Chapter Images or possibly Power Point files:

ICONS	CH
   	**1. SLIDE 1 Ch61 AUTONOMOUS VEHICLES** **Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/** **WEB SITE IS CONSTANTLY UPDATED** **http://www.jameshalderman.com/automotive_principles.html** **DOWNLOAD** **Crossword Puzzle (Microsoft Word) (PDF)** **Word Search Puzzle (Microsoft Word) (PDF** **DISCUSS FREQUENTLY ASKED QUESTION:** ***What is Meant by Human-Machine Interface (HMI)?*** **HMI was very basic in past because vehicles were equipped with most of following to let driver know what vehicle (machine) was doing:** • **Speedometers** • **Fuel level gauge** • **Engine coolant temperature** • **Oil pressure (some vehicles)** **Advance technology vehicles, and especially Autonomous vehicles, need to communicate to driver or occupants) using:** 1. **Visual displays (eyes)** 2. **Sounds** 3. **Tactile (called "haptic" feedback vibrations of the seat or the steering wheel, which are created using a DC motor turning an offset weight to create vibrations) hardware involved includes:** • **A display** • **Speakers** • **Input devices, such as a mouse or joystick** • **Microphone for voice commands**

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	• **Behind scenes, software is used to sort out the vast amount of information and reduce it to the levels where driver can understand and react to situations as needed.** **DISCUSS CHART 61-1 SAE J3016 levels of automated vehicle capabilities.**
	**2. SLIDE 2 EXPLAIN FIGURE 61–1** A graphic example of who is driving and monitoring the conditions, and who can intervene if a situation requires evasive action**.**
	3. SLIDE 3 EXPLAIN FIGURE 61–2 A pre-collision system is designed to prevent a collision first, and then interacts to prepare for a collision, if needed**.**
	**DISCUSS CASE STUDY: *The Case of The Inoperative Radar Cruise Control* The driver of a Lexus NX experienced a situation where radar cruise control stopped working due to ice on sensor after driving through light snow showers. When front was checked, it was discovered that ice had accumulated on front grille. Using an ice scraper brush, grille was cleaned, which restored the proper operation of the radar cruise control. • SEE FIGURE 61–3. In automated vehicles, the sensors need to be heated, and maybe cleaned, so that they can operate under all driving conditions.** **Summary:** • **Complaint—Radar cruise stopped working and a message appeared to clean sensor.** • **Cause—Ice buildup on grille.** • **Correction—Cleaning grille using a brush restored proper operation of radar cruise control.**
	**DISCUSSION: Have the students talk about the Radar Cruise Control Systems. How do these systems operate?**

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    	**DISCUSSION:** **Discuss why Radar Cruise Control does not normally interfere with a radar detector. What are the frequencies of long-range and short range radar?** **4. SLIDE 4 EXPLAIN FIGURE 61–3** (a) The dash warning message that appeared when cruise control stopped working (b) The front of a Lexus shows some ice build-up that was enough to block the radar signals needed for the radar cruise control to work. **5. SLIDE 5 EXPLAIN FIGURE 61–4** Artificial intelligence includes the hardware and software needed to make judgments based on the input from sensors and knowledge of the surrounding environment. **6. SLIDE 6 EXPLAIN FIGURE 61–5** An exploded view of a typical radar assembly located at the front of the vehicle. **DISCUSS CASE STUDY: *The Case of Moving Truck:* A new self-driving shuttle bus got off to a bumpy start in Las Vegas. When the service started, one of the driverless vehicles was involved in a collision with a delivery truck. During the incident, the bus automatically stopped, avoiding an accident after its sensors detected the truck. Unfortunately, delivery truck did not stop and grazed front fender of the shuttle. The owner of shuttle said: "If truck had same sensing equipment that shuttle has, accident would have been avoided."** **Summary:** • **Complaint—A self-driving bus was hit by a truck.** • **Cause—While the self-driving bus stopped in time to avoid an accident, the truck, being driven by a human, did not.** • **Correction—No changes were necessary, but instead more self-driving vehicles are needed to avoid accidents.**

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	**7. SLIDE 7 EXPLAIN FIGURE 61–6** A charge coupled device (CCD) is an integrated circuit on a silicon surface forming light-sensitive elements called pixels. The light photons generate a charge that can be used by electronics and turned into a digital copy of image on the device. **8. SLIDE 8 EXPLAIN FIGURE 61–7** Lidar is a detection system that uses light from a laser to create a picture of the surrounding area. **9. SLIDE 9 EXPLAIN FIGURE 61–8** Ultrasound sensors are used at the front and rear of many vehicles and are used for detection of objects that are close to vehicle. **10. SLIDE 10 EXPLAIN FIGURE 61–9** A brake by-wire system using all electronic controls can eventually replace the hydraulic-based systems used on vehicles. **11. SLIDE 11 EXPLAIN FIGURE 61–10** advanced driver assist systems (ADRS) require that the sensors used be calibrated if there was a change in the alignment of if there was any damage done to the vehicle that could affect the cameras, or radar. (a) Most service information will include specific dimension for the areas where the calibrations needs to be performed. (b) Unique targets are needed to be used to calibrate the cameras and radar.