Automotive Technology 6th Edition
Chapter 112 Electronic Stability Control Systems
Opening Your Class

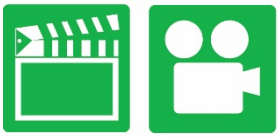
KEY ELEMENT	EXAMPLES
Introduce Content	This Automotive Technology 6th text provides complete coverage of automotive components, operation, design, and troubleshooting. It correlates material to task lists specified by ASE and ASEEducation (NATEF) and emphasizes a problem-solving approach. Chapter features 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. Discuss the need for electronic stability control (ESC). 2. List the requirements for ESC systems. 3. Describe how to test the functioning of an ESC system. 4. List the sensors needed for the ESC system. 5. Describe how a traction control (TC) system works. 6. List the steps in the diagnostic process for ESC and TC system faults.
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 112 Chapter Images: From

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

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

ICONS	Chapter 112 ESC Operation & Service
	**1. SLIDE 1 CH112 ELECTRONIC STABILITY CONTROL SYSTEMS** **2. SLIDE 2 EXPLAIN Figure 112-1** electronic stability control (ESC) system applies individual wheel brakes to keep the vehicle under control of the driver.
	**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**
	**Videos**
	**DEMONSTRATION: Using a 1/32 scale model car show the students how a vehicle can over and under steer**
	**DISCUSSION: Ask students to discuss the terms over steer and under steer. Ask students to talk about the dangers of over steer and what may cause this. Ask students to talk about the dangers of under steer and what may cause this.**
	**Traction Control (View) (Download)**
	**DISCUSSION: Ask students to talk about how the FMVSS No. 126 will affect design of vehicles after 2011.**
	**3. SLIDE 3 EXPLAIN Figure 112-2** sine with dwell test is designed to test the electronic stability control (ESC) system to determine if the system can keep the vehicle under control
	**DEMONSTRATION: Show students a sine wave as it would appear on an oscilloscope.**

ICONS	Chapter 112 ESC Operation & Service
	**DISCUSS FREQUENTLY ASKED QUESTION: *Can a Vehicle with a Modified Suspension Pass the Test?* Yes, if system is properly engineered. To be sure, check with company offering a suspension test to verify that vehicle will still be able to pass sine with dwell (SWD) test. This ensures that any changes are within range where ESC system can control vehicle during emergency maneuvers. • SEE FIGURE 112–3.**
	4. **SLIDE 4 EXPLAIN FIGURE 112–3** Using a simulator is the most cost-effective way for vehicle and aftermarket suspension manufacturers to check that vehicle is able to perform within the FMVSS No. 126 standard for vehicle stability.
	**DISCUSSION: Have students talk about the Sine with Dwell test. How does this test check the operation of the ESC system?**
	**Ratio of the length of the side opposite the given angle to the length of the hypotenuse of a right-angled triangle**
	**DEMONSTRATION: SHOW the operation of an ESC or Traction control system**
	**DISCUSSION: Have the students talk about the use of simulators to test ESC systems. Have students talk about how simulators and video games are similar.**
	5. **SLIDE 5 EXPLAIN FIGURE 112–4** hand-wheel position sensor is usually located at base of steering column..
	6. **SLIDE 6 EXPLAIN Figure 112-5** Hand-wheel (steering wheel) position sensor schematic.
	**DEMONSTRATION: Show students a steering wheel position sensor. Show students how the resistance changes as the wheel is turned**

ICONS	Chapter 112 ESC Operation & Service
	**DISCUSSION:** **Have students talk about how the side ways movement in a vehicle affects the drivers comfort level.**
	7. **SLIDE 7 EXPLAIN Figure 112-6** VS sensor information transmitted to EBCM by Class 2 serial data. 8. **SLIDE 8 EXPLAIN Figure 112-7** schematic showing the lateral acceleration sensor and EBCM.
	**HANDS-ON TASK: Have students design and build their own lateral acceleration sensor using a spring, wheel weight and a protractor. As lateral force it applied to the sensor the weight will move an arrow along the scale of the protractor.**
	**DEMONSTRATION: Show students how to do the Quick and easy lateral acceleration sensor test.**
	**HANDS-ON TASK: Have students perform the quick and easy lateral acceleration sensor test on several different lab vehicles**
	**EXPLAIN TECH TIP: *Quick and Easy Lateral Acceleration Sensor Test.*** **Most factory scan tools will display the value of sensors, including the lateral acceleration sensor. However, sensor value will read zero unless vehicle is cornering. A quick and easy test of the sensor is to simply unbolt sensor and rotate it 90 degrees with the key on engine off. • SEE FIGURE 112–8. Now sensor is measuring force of gravity and should display 1.0 G on the scan tool. If sensor does not read close to 1.0 G or reads zero all of time, sensor or wiring is defective.**
	9. **SLIDE 9 EXPLAIN Figure 112-8** A lateral acceleration sensor is usually located under the center console and can be easily checked by unbolting it and turning it on its side while monitoring the sensor value using a scan tool 10. **SLIDE 10 EXPLAIN Figure 112-9** Yaw rate sensor showing the typical locations and schematic.

ICONS	Chapter 112 ESC Operation & Service
     	**ON-VEHICLE ASEEDUCATION TASK: G1. Identify and inspect electronic brake control system components (ABS, TCS, ESC); determine needed action.** **ON-VEHICLE ASEEDUCATION TASK: Identify traction/vehicle stability control system components** **11. SLIDE 11 EXPLAIN Figure 112-10** Typical traction control system that uses wheel speed sensor information and the engine controller (PCM) to apply the brakes at lower speeds and also reduce engine power applied to the drive wheels. **12. SLIDE 12 EXPLAIN Figure 112-11** Wheel speed sensor information is used to monitor if a drive wheel is starting to spin. **13. SLIDE 13 EXPLAIN Figure 112-12** A traction control or low traction light on the dash is confusing to many drivers. When the lamp is on or flashing, it indicates that a low traction condition has been determined and the traction control system is working to restore traction. A flashing traction dash light does not indicate a fault. **DISCUSS FREQUENTLY ASKED QUESTION: *Does Traction Control Engage Additional Drive Wheels*? When term traction control is used, many people think of four-wheel-drive or all-wheel-drive vehicles and power trains. Instead of sending engine torque to other drive wheels, it is purpose and function of traction control system to prevent drive wheel(s) from slipping during acceleration. A slipping tire has less traction than a non-slipping tire—therefore, if tire can be kept from slipping (spinning), more traction will be available to propel vehicle. Traction control works with the engine computer to reduce torque delivery from engine, as well as controller to apply the**

ICONS	Chapter 112 ESC Operation & Service
	brakes to the spinning wheel if necessary to regain traction.
	**DEMONSTRATION: Show students components of a vehicle with traction control. Show students the instrument panel light and switch that is present on vehicles with traction control.**
	**DISCUSSION: Have students talk about instances where traction control would not be useful**
	**DEMONSTRATION: Show students the ways that manufactures have developed to lower the torque to the drive wheels**
	**DISCUSSION: Have students talk about how the traction active lamp illuminating on the dash board would help them in driving through icy conditions. Have students talk about driving conditions that they would deactivate the traction control system.**
	**14. SLIDE 14 EXPLAIN Figure 112-13** use of a factory scan tool is often needed to diagnose the ESC system.
	**DEMONSTRATION: Show students how to do a proper visual inspection of the ESC and TC systems on the vehicle**
	**DISCUSSION: Have students talk about the difference between traction control and engaging automatic four wheel drive. Have students talk about why it is important to verify the customer's complaint before trying to diagnose a problem.**
	**HANDS-ON TASK: Have students follow a trouble shooting procedure specified by a specific manufacture to diagnose ESC/TC system.**
	**SEARCH INTERNET: Have students research the internet and report on the front steering of a NASCAR of today. Do they over steer or under steer. Does a driver want a loose condition on their front steering? Select a student from the class to report on their findings during the next class.**