

Automotive Steering, Suspension, & Alignment 7e

Chapter 10 Electronic Stability Control Systems

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of Automotive Steering and Suspension Systems with Wheel Alignment and Drive Axles . It correlates material to task lists specified by ASE and NATEF
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.	<p>Explain the chapter learning objectives to the students.</p> <ol style="list-style-type: none"> 1. Discuss the need for electronic stability control (ESC). 2. List the sensors needed for the ESC system. 3. Describe how a traction control system works. 4. List the steps in the diagnostic process for ESC and TC system faults. <p>This chapter will help you prepare for Brakes (A4) ASE certification test content area "F" (Antilock Brake System Diagnosis and Repair).</p>
Establish the Mood or Climate	Provide a <i>WELCOME</i> , 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: This lesson plan is based on Automotive Steering, Suspension, & Alignment 7th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com
LINK CHP 10: [Chapter Images](#)

ICONS

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1. SLIDE 1 ELECTRONIC STABILITY CONTROL SYSTEMS

Check for **ADDITIONAL VIDEOS & ANIMATIONS** @ <http://www.jameshalderman.com/>
WEB SITE IS CONSTANTLY UPDATED

ABS Traction Control (44 Links)

At the beginning of this class, you can download the crossword puzzle & Word Search from the links below to familiarize your class with the terms in this chapter & then discuss them











Crossword Puzzle (Microsoft Word) (PDF)

Word Search Puzzle (Microsoft Word) (PDF)

2. SLIDE 2 **EXPLAIN** FIGURE 10-1 electronic stability control (ESC) system applies individual wheel brakes to keep the vehicle under control of the driver.

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.

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	<p>DISCUSSION: ASK STUDENTS TO TALK ABOUT HOW THE FMVSS NO. 126 WILL AFFECT DESIGN OF VEHICLES AFTER 2011.</p>
	<p>3. SLIDE 3 EXPLAIN FIGURE 10-2 sine with dwell test is designed to test electronic stability control (ESC) system to determine if the system can keep vehicle under control</p>
	<p>DEMONSTRATION: SHOW STUDENTS A SINE WAVE AS IT WOULD APPEAR ON AN OSCILLOSCOPE.</p>
	<p>DISCUSSION: HAVE STUDENTS TALK ABOUT THE SINE WITH DWELL TEST. HOW DOES THIS TEST CHECK THE OPERATION OF THE ESC SYSTEM?</p>
	<p>RATIO OF LENGTH OF SIDE OPPOSITE THE GIVEN ANGLE TO LENGTH OF HYPOTENUSE OF A RIGHT-ANGLED TRIANGLE</p>
 	<p>DEMONSTRATION: SHOW THE OPERATION OF AN ESC OR TRACTION CONTROL SYSTEM</p>
	<p>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.</p>
	<p>4. SLIDE 4 EXPLAIN FIGURE 10-3 Using simulator is most cost-effective way for vehicle & aftermarket suspension manufacturers to check that vehicle able to perform within FMVSS No. 126 standard for stability.</p>
	<p>5. SLIDE 5 EXPLAIN FIGURE 10-4 hand-wheel position sensor is usually located at base of steering column.</p>
	<p>6. SLIDE 6 EXPLAIN FIGURE 10-5 Hand-wheel (steering wheel) position sensor schematic</p> <p>DEMONSTRATION: SHOW STUDENTS A STEERING WHEEL POSITION SENSOR. SHOW STUDENTS HOW THE RESISTANCE CHANGES AS THE WHEEL IS TURNED</p>
	

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DISCUSSION: HAVE STUDENTS TALK ABOUT HOW THE SIDEWAYS MOVEMENT IN A VEHICLE AFFECTS THE DRIVERS COMFORT LEVEL.

7. **SLIDE 7 EXPLAIN FIGURE 10-6** VS sensor information transmitted to EBCM by Class 2 serial data.
8. **SLIDE 8 EXPLAIN FIGURE 10-7** 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 IS 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

9. **SLIDE 9 EXPLAIN FIGURE 10-8** lateral acceleration sensor is located under center console and can be easily checked by unbolting it and turning it on its side while monitoring sensor value using a scan tool. When it is on its side sensor value should read one G
10. **SLIDE 10 EXPLAIN FIGURE 10-9** Yaw rate sensor showing the typical locations and schematic.

ON-VEHICLE NATEF TASK: IDENTIFY TRACTION/VEHICLE STABILITY CONTROL SYSTEM COMPONENTS

11. **SLIDE 11 EXPLAIN FIGURE 10-10** Typical traction control system uses wheel speed sensor information & engine controller (PCM) to apply brakes at lower speeds & also reduce engine power applied to drive wheels.
12. **SLIDE 12 EXPLAIN FIGURE 10-11** Wheel speed sensor info used to monitor if wheel starting to spin.
13. **SLIDE 13 EXPLAIN FIGURE 10-12** traction control or low traction light on dash is confusing to many drivers. When lamp is on or flashing, it indicates that a low traction condition has been determined and traction control system

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	<p>is working to restore traction. A flashing traction dash light does not indicate a fault.</p> <p>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.</p>
	<p>DISCUSSION: HAVE STUDENTS TALK ABOUT INSTANCES WHERE TRACTION CONTROL WOULD NOT BE USEFUL</p>
	<p>DEMONSTRATION: SHOW STUDENTS THE WAYS THAT MANUFACTURES HAVE DEVELOPED TO LOWER THE TORQUE TO THE DRIVE WHEELS</p>
	<p>DISCUSSION: TALK ABOUT HOW 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.</p>
	<p>14. SLIDE 14 EXPLAIN FIGURE 10-13 use of a factory scan tool is often needed to diagnose the ESC system.</p>
	<p>DEMONSTRATION: SHOW STUDENTS HOW TO DO A PROPER VISUAL INSPECTION OF THE ESC AND TC SYSTEMS ON THE VEHICLE</p>
	<p>DISCUSSION: TALK ABOUT DIFFERENCE BETWEEN TRACTION CONTROL & ENGAGING AUTOMATIC 4WD. HAVE STUDENTS TALK ABOUT WHY IT IS IMPORTANT TO VERIFY CUSTOMER'S COMPLAINT BEFORE TRYING TO DIAGNOSE</p>
	<p>HANDS-ON TASK: HAVE STUDENTS FOLLOW A TROUBLE SHOOTING PROCEDURE SPECIFIED BY A SPECIFIC OEM TO DIAGNOSE ESC/TC SYSTEM.</p>
	<p>SEARCH INTERNET: HAVE STUDENTS RESEARCH 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?</p>