Automotive Chassis Systems 7th Edition

Chapter 19 Electronic Stability Control Systems

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of **Automotive Chassis Systems.** 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.	Explain the chapter learning objectives to the students. 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. **This chapter will help you prepare for the Brakes (A5) ASE certification test content areas "G" (Electronic Brake Control Service).**
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: This lesson plan is based on Automotive Chassis Systems 7th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com

LINK CHP 19: Chapter Images

ICONS	Ch19 Electronic Stability Control Systems
	**1. SLIDE 1 ELECTRONIC STABILITY CONTROL SYSTEMS**
	**Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/** **WEB SITE IS CONSTANTLY UPDATED** **Videos**
	**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**
	**Word Search Puzzle (Microsoft Word) (PDF)** **Word Search Puzzle (Microsoft Word) (PDF)**
	**Traction Control (View) (Download)**
	**2. SLIDE 2 EXPLAIN Figure 19-1** 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.**
	**DISCUSSION: ASK STUDENTS TO TALK ABOUT HOW THE FMVSS NO. 126 WILL AFFECT DESIGN OF VEHICLES AFTER 2011.**

ICONS	Ch19 Electronic Stability Control Systems
	3. **SLIDE 3** EXPLAIN **Figure 19-2** sine with dwell test is designed to test electronic stability control (ESC) system to determine if the system can keep vehicle under control
	**DEMONSTRATION: SHOW STUDENTS A SINE WAVE AS IT WOULD APPEAR ON AN OSCILLOSCOPE.**
	**DISCUSSION: HAVE STUDENTS TALK ABOUT THE SINE WITH DWELL TEST. HOW DOES THIS TEST CHECK THE OPERATION OF THE ESC SYSTEM?**
	**RATIO OF LENGTH OF SIDE OPPOSITE THE GIVEN ANGLE TO LENGTH OF 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.**
	4. **SLIDE 4** EXPLAIN **Figure 19–3** Using a simulator is most cost-effective way for vehicle & aftermarket suspension manufacturers to check that vehicle is able to perform within FMVSS No. 126 standard for vehicle stability. 5. **SLIDE 5** EXPLAIN **Figure 19-4** hand-wheel position sensor is usually located at base of steering column. 6. **SLIDE 6** EXPLAIN **Figure 19-5** 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**
	**DISCUSSION: HAVE STUDENTS TALK ABOUT HOW THE SIDE WAYS MOVEMENT IN A VEHICLE AFFECTS THE DRIVERS COMFORT LEVEL.**
	7. **SLIDE 7** EXPLAIN **Figure 19-6** VS sensor information transmitted to EBCM by Class 2 serial data. 8. **SLIDE 8** EXPLAIN **Figure 19-7** schematic showing the lateral acceleration sensor and EBCM.

ICONS	Ch19 Electronic Stability Control Systems
	**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
	9. **SLIDE 9 EXPLAIN Figure 19–8** A lateral acceleration sensor is usually 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 19-9** 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 19-10** 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 19-11** Wheel speed sensor information is used to monitor if a drive wheel is starting to spin. 13. **SLIDE 13 EXPLAIN Figure 19-12** 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.
	**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.

ICONS	Ch19 Electronic Stability Control Systems
	**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 19-13** 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:** 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
	**HANDS-ON TASK:** HAVE STUDENTS FOLLOW A TROUBLE SHOOTING PROCEDURE SPECIFIED BY A SPECIFIC OEM TO DIAGNOSE ESC/TC SYSTEM.
	**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?