























A5 BRAKES 6th Edition












Chapter 21 Electronic Stability Control Systems










Opening Your Class

| KEY ELEMENT | EXAMPLES |
|--|---|
| Introduce Content | This course or class covers operation and service of Automotive Brakes . 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. <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. |
| 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. |

| ICONS | Ch21 Electronic Stability Control Systems |
|--|--|
|      | <p>1. SLIDE 1 ELECTRONIC STABILITY CONTROL SYSTEMS</p> <p>2. SLIDES 2-3 EXPLAIN OBJECTIVES</p> <p>Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/ WEB SITE IS CONSTANTLY UPDATED</p> <p>ABS Traction Control (44 Links) VIDEOS</p> <p>4. SLIDES 4-6 EXPLAIN Need for Electronic Stability Control</p> <p>7. SLIDE 7 EXPLAIN Figure 21-1 electronic stability control (ESC) system applies individual wheel brakes to keep the vehicle under control of the driver.</p> <p>8. SLIDES 8-10 EXPLAIN Federal Motor Vehicle Safety Standard (FMVSS) No. 126</p> |
|    <p>QUESTION</p> | <p><u>DEMONSTRATION:</u> USING A 1/32 SCALE MODEL CAR SHOW THE STUDENTS HOW A VEHICLE CAN OVER AND UNDER STEER</p> <p><u>DISCUSSION:</u> 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.</p> |
|   | <p><u>ANIMATION: OVERSTEERING</u> WWW.MYAUTOMOTIVELAB.COM <small>HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYAUTOMOTIVELAB_2/BRAKES/AUTO_ANIMATIONS/A5-21A/INDEX.HTML</small></p> <p><u>ANIMATION: UNDERSTEERING</u> WWW.MYAUTOMOTIVELAB.COM <small>HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYAUTOMOTIVELAB_2/BRAKES/AUTO_ANIMATIONS/A5-21B/INDEX.HTML</small></p> |
|   <p>QUESTION</p> | <p><u>DISCUSSION:</u> ASK STUDENTS TO TALK ABOUT HOW THE FMVSS NO. 126 WILL AFFECT DESIGN OF VEHICLES AFTER 2011.</p> |

| ICONS | Ch21 Electronic Stability Control Systems |
|---|--|
|  | <p>11. SLIDE 11 EXPLAIN Figure 21-2 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>12. SLIDE 12 EXPLAIN Figure 21-3 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.</p> |
| | <p>13. SLIDE 13 EXPLAIN ESC Sensors</p> |
| | <p>14. SLIDE 14 EXPLAIN Figure 21-4 hand-wheel position sensor is usually located at base of steering column.</p> |
| | <p>15. SLIDE 15 EXPLAIN Figure 21-5 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> |
|  | <p>DISCUSSION: HAVE STUDENTS TALK ABOUT HOW THE SIDE WAYS MOVEMENT IN A VEHICLE AFFECTS THE DRIVERS COMFORT LEVEL.</p> |

| ICONS | Ch21 Electronic Stability Control Systems |
|---|--|
|  | <p>16. SLIDE 16 EXPLAIN Figure 21-6 VS sensor information transmitted to EBCM by Class 2 serial data.</p> <p>17. SLIDE 17 EXPLAIN Figure 21-7 schematic showing the lateral acceleration sensor and EBCM.</p> |
|  | <p>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.</p> |
|  | <p>DEMONSTRATION: SHOW STUDENTS HOW TO DO THE QUICK AND EASY LATERAL ACCELERATION SENSOR TEST.</p> |
|  | <p>HANDS-ON TASK: HAVE STUDENTS PERFORM THE QUICK AND EASY LATERAL ACCELERATION SENSOR TEST ON SEVERAL DIFFERENT LAB VEHICLES</p> |
|  | <p>18. SLIDE 18 EXPLAIN Figure 21-8 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</p> |
|  | <p>19. SLIDE 19 EXPLAIN Figure 21-9 Yaw rate sensor showing the typical locations and schematic.</p> |
|  | <p>ON-VEHICLE NATEF TASK: IDENTIFY TRACTION/VEHICLE STABILITY CONTROL SYSTEM COMPONENTS</p> |
|  | <p>20. SLIDE 20 EXPLAIN Figure 21-10 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.</p> |
|  | <p>21. SLIDE 21 EXPLAIN Traction Control Components</p> |
|  | <p>22. SLIDE 22 EXPLAIN Figure 21-11 Wheel speed sensor information is used to monitor if a drive wheel is starting to spin.</p> |
|  | <p>23. SLIDE 23 EXPLAIN Figure 21-12 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</p> |

| ICONS | Ch21 Electronic Stability Control Systems |
|---|--|
|  | <p>traction control system is working to restore traction. A flashing traction dash light does not indicate a fault.</p> <p><u>DEMONSTRATION:</u> 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><u>DISCUSSION:</u> HAVE STUDENTS TALK ABOUT INSTANCES WHERE TRACTION CONTROL WOULD NOT BE USEFUL</p> |
|  | <p><u>DEMONSTRATION:</u> SHOW STUDENTS THE WAYS THAT MANUFACTURES HAVE DEVELOPED TO LOWER THE TORQUE TO THE DRIVE WHEELS</p> |
|  | <p><u>DISCUSSION:</u> 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.</p> |
|  | <p>24. SLIDES 24-25 EXPLAIN ESC/TC Diagnosis</p> <p>26. SLIDE 26 EXPLAIN Figure 21-13 use of a factory scan tool is often needed to diagnose the ESC system.</p> <p>27. SLIDES 27-32 EXPLAIN SUMMARY</p> |
|  | <p><u>DEMONSTRATION:</u> SHOW STUDENTS HOW TO DO A PROPER VISUAL INSPECTION OF THE ESC AND TC SYSTEMS ON THE VEHICLE</p> |
|  | <p><u>DISCUSSION:</u> 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><u>HANDS-ON TASK:</u> HAVE STUDENTS FOLLOW A TROUBLE SHOOTING PROCEDURE SPECIFIED BY A SPECIFIC OEM TO DIAGNOSE ESC/TC SYSTEM.</p> |
|  | <p><u>SEARCH INTERNET:</u> 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</p> |

| | |
|--------------|--|
| ICONS | Ch21 Electronic Stability Control Systems |
| | CONDITION ON THEIR FRONT STEERING? |