

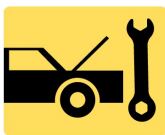
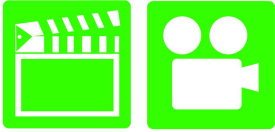
Automotive Maintenance and Light Repair, 1ST Edition

Chapter 45 TIRES & WHEELS

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers Automotive Maintenance and Light Repair . 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. <ul style="list-style-type: none">— Prepare for ASE Suspension and Steering (A4) certification test content area “E” (Wheel and Tire Diagnosis and Repair).— Discuss tire sizes and ratings.— Describe tire purchasing considerations and maintenance.— Explain the construction and sizing of steel and alloy wheels and attaching hardware.— Demonstrate the correct lug nut tightening procedure and torque.
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



Ch45 TIRES & WHEELS

1. SLIDE 1 CH45 TIRES & WHEELS
2. SLIDES 2-3 EXPLAIN OBJECTIVES

Check for **ADDITIONAL VIDEOS & ANIMATIONS**
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4. SLIDES 4-5 EXPLAIN Introduction to Tires
6. SLIDE 6 EXPLAIN TREAD

7. SLIDE 7 EXPLAIN Figure 45-1 (a) typical tire tread depth gauge. The center movable plunger is pushed down into the groove of the tire. **EXPLAIN (b)** tread depth is read at the top edge of the sleeve. In this example, the tread depth is 6/32 in.

DEMONSTRATION: SHOW TYPICAL TREAD DEPTH GAUGE. EXPLAIN HOW TO USE IT, SEE FIGURE 45-1

DISCUSSION: ASK THE STUDENTS TO DISCUSS OTHER POSSIBLE SYMPTOMS OF BAD OR DEFECTIVE TIRES. ASK THE STUDENTS TO DISCUSS THE IMPORTANCE OF TREAD DEPTH AND TO DISCUSS WHY ALL TIRE MANUFACTURERS DON'T USE THE SAME STANDARD DEPTH.

HANDS-ON TASK: HAVE THE STUDENTS USE A TREAD DEPTH GAUGE TO MEASURE TREAD DEPTH. ASK THEM TO READ YOU THE GAUGE AND INDICATE DEPTH OF TREAD.

8. SLIDE 8 EXPLAIN Figure 45-2 Wear indicators (wear bars) are strips of bald tread that show when tread depth is down to 2/32 in., legal limit in many states.

DEMONSTRATION: SHOW EXAMPLES OF TIRES WITH WEAR BARS, FIGURE 45-2

DISCUSSION: DISCUSS WHETHER THERE IS A GENERALLY ACCEPTED PRACTICE REGARDING REPAIR OF TIRES WITH SIDEWALL PUNCTURES. DISCUSS WHY IT IS NECESSARY TO REPLACE A TIRE IF THE TIRE'S BEAD IS CUT OR DAMAGED.

ICONS**Ch45 TIRES & WHEELS****QUESTION**

ASK STUDENTS TO DISCUSS WHICH ARE STRONGER: BIAS-PLY TIRES OR RADIAL-PLY TIRES.

HANDS-ON TASK: USING A TIRE CRAYON, HAVE STUDENTS CIRCLE WEAR BARS ON BOTH NEW & USED TIRES.

9. **SLIDE 9 EXPLAIN** Figure 45-3 tire tread runs around the circumference of the tire, and its pattern helps maintain traction. The ribs provide grip, while the grooves direct any water on the road away from the surface. The sipes help the tire grip the road.

10. **SLIDE 10 EXPLAIN** Figure 45-4 Hydroplaning can occur at speeds as low as 30 mph (48 km/h). If the water is deep enough and the tire tread cannot evacuate water through its grooves fast enough, the tire can be lifted off the road surface by a layer of water. Hydroplaning occurs at lower speeds as the tire becomes worn.

11. **SLIDE 11 EXPLAIN SIDEWALL**

12. **SLIDES 12-13 EXPLAIN BEAD**

14. **SLIDE 14 EXPLAIN** Figure 45-5 Typical construction of a radial tire. Some tires have only one body ply, and some tires use more than two belt plies.

15. **SLIDE 15 EXPLAIN Body Ply**

16. **SLIDES 16-17 EXPLAIN BELTS**








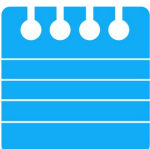





18. **SLIDE 18 EXPLAIN Inner Liner**








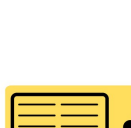


19. **SLIDES 19-20 EXPLAIN MAJOR SPLICE**
















21. **SLIDE 21 EXPLAIN** Figure 45-6 The major splice of a tire can often be seen and felt on the inside of the tire. The person who assembles (builds) the tire usually places a sticker near the major splice as a means of identification for quality control

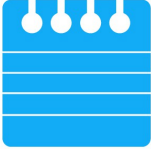






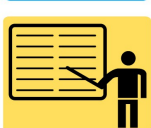


DEMONSTRATION: USING BOTH NEW AND USED TIRES, SHOW THE STUDENTS THE MAJOR SPLICE.














DISCUSSION: ASK THE STUDENTS TO DISCUSS WHY DAMAGE TO THE INNER LINER WILL CAUSE A FLAT TIRE.



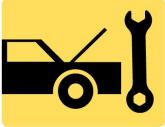


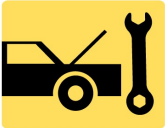


ICONS	Ch45 TIRES & WHEELS
	<p>22. SLIDE 22 EXPLAIN Figure 45-7 Tire construction is performed by assembling the many parts of a tire together on a tire-building machine.</p>
	<p>23. SLIDE 23 EXPLAIN Figure 45-8 After the entire tire has been assembled into a completed “green” tire, it is placed into a tire-molding machine where the tire is molded into shape and the rubber is changed chemically by the heat. This nonreversible chemical reaction is called vulcanization</p>
	<p>DISCUSSION: ASK THE STUDENTS TO DISCUSS PROBLEMS THAT WOULD DEVELOP BY USING A SPACE-SAVING SPARE TIRE OVER AN EXTENDED PERIOD OF TIME.</p>
	<p>24. SLIDE 24 EXPLAIN Figure 45-9 TIRE DIAMETER</p>
	<p>25. SLIDE 25 EXPLAIN Figure 45-10 Cross-sectional view of a typical tire showing the terminology.</p>
	<p>DEMONSTRATION: SHOW HOW TO DECODE SEVERAL TIRE SIZES USING SERVICE DESCRIPTION. FIGURE 45-10</p>
	<p>HANDS-ON TASK: HAVE THE STUDENTS DECODE SEVERAL TIRE SIZES USING SERVICE DESCRIPTION. FIGURE 45-10</p>
	<p>WHEN CHANGING FROM AN OLDER TIRE MEASURING SYSTEM TO A NEWER SYSTEM, SPEEDOMETER CALIBRATION SHOULD BE CHECKED.</p>
	<p>DEMONSTRATION: SHOW HOW TO DECODE THE METRIC TIRE CODING AND EXPLAIN IT</p>
	<p>HANDS-ON TASK: HAVE STUDENTS DECODE SEVERAL METRIC TIRE SIZES.</p>
	<p>26. SLIDE 26 EXPLAIN High-Flotation Tire Sizes</p>
	<p>27. SLIDE 27 EXPLAIN Load Index and Equivalent Loads</p>
	<p>28. SLIDE 28 EXPLAIN Figure 45-11 Typical sidewall markings for load index & speed rating following tire size.</p>





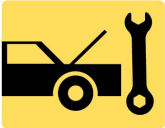


ICONS	Ch45 TIRES & WHEELS
	<p>DISCUSSION: ASK THE STUDENTS WHETHER USING TIRES WITH SUFFIX LT (LIGHT TRUCK) IS ACCEPTABLE ON PASSENGER CARS AND/OR SUVs.</p>
	<p>DISCUSSION: ASK STUDENTS TO DISCUSS THE ADVANTAGES, IF ANY, OF USING RADIAL TIRES ON AN OLDER AUTOMOBILE.</p>
	<p>DISCUSSION: ASK THE STUDENTS HOW CHANGING THE SECTION HEIGHT WILL AFFECT THE RIDE QUALITY</p>
	<p>29. SLIDE 29 EXPLAIN Speed Ratings</p> <p>30. SLIDE 30 EXPLAIN FIGURE 45-12 E.C.E. symbol on a sidewall of a tire. Notice the small -s at the end, indicating that the tire meets the “pass-by” noise limits.</p>
	<p>DISCUSSION: ASK THE STUDENTS WHY TIRES ARE MANUFACTURED WITH H-SPEED RATINGS OF 130 MPH OR 210 KM/H DESPITE THE FACT THAT DRIVING THAT FAST WOULD NOT ONLY BE UNSAFE BUT ALSO ILLEGAL IN MOST AREAS OF THE WORLD.</p>
	<p>DISCUSSION: ASK STUDENTS TO COMPARE DOT STANDARDS & E.C.E. (ECONOMIC COMMISSION FOR EUROPEAN SMALL “E”) STANDARDS. ASK STUDENTS TO DISCUSS WHETHER US SHOULD HAVE ANTI-NOISE STANDARDS SIMILAR TO E.C.E PASS-BY NOISE LIMITS.</p>
	<p>31. SLIDE 31 EXPLAIN Figure 45-13 typical door placard used on a GM vehicle indicating recommended tire inflation. Note that information also includes tire size and speed rating of tire as well as recommended wheel size</p>
	<p>DEMONSTRATION: SHOW THE STUDENTS HOW TO DETERMINE PROPER TIRE PRESSURE BY USING THE INFORMATION ON DOOR PLACARDS.</p>
	<p>HANDS-ON TASK: HAVE STUDENTS COMPARE TIRE PRESSURE RECOMMENDATIONS OF SEVERAL AUTOMOBILES BY USING THE INFORMATION ON DOOR PLACARDS.</p>
	<p>32. SLIDE 32 EXPLAIN Tire Conicity and Ply Steer</p> <p>33. SLIDE 33 EXPLAIN Figure 45-14 Conicity is a fault in the tire that can cause the vehicle to pull to one side</p>

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	<p>due to the cone effect (shape) of the tire</p> <p><u>DEMONSTRATION: USING A FOAM CUP, SHOW THE STUDENTS HOW A CONE SHAPE WILL CAUSE A PULL.</u></p>
	<p>34. SLIDE 34 EXPLAIN Figure 45-15 Notice the angle of the belt material in this worn tire. The angle of the belt fabric can cause a “ply steer” or slight pulling force toward one side of the vehicle</p>
	<p>35. SLIDE 35 EXPLAIN Vehicle Handling and Tire Slip Angle</p>
	<p>36. SLIDE 36 EXPLAIN Figure 45-16 Slip angle is the angle between the direction the tire tread is heading and the direction it is pointed.</p>
	<p>37. SLIDE 37 EXPLAIN Rim Width and Tire Size</p>
  <p>QUESTION</p>	<p><u>DISCUSSION: ASK THE STUDENTS TO DISCUSS HOW TREAD DEPTH AND ASPECT RATIO AFFECT TIRE SLIP ANGLE</u></p>
	<p>38. SLIDES 38-39 EXPLAIN Uniform Tire Quality Grading System</p>
	<p>40. SLIDE 40 EXPLAIN Figure 45-17 typical “Uniform Tire Quality Grading System” (UTQGS) ratings imprinted on the tire sidewall</p>
	<p>41. SLIDE 41 EXPLAIN Uniform Tire Quality Grading System</p>
  <p>QUESTION</p>	<p><u>DISCUSSION: ASK THE STUDENTS TO DISCUSS WHETHER PEOPLE LIVING IN HOT CLIMATES SHOULD PURCHASE TIRES WITH <u>C</u> TEMPERATURE RESISTANCE RATING.</u></p>
	<p>42. SLIDE 42 EXPLAIN All-Season Tire Designation</p>
  <p>QUESTION</p>	<p><u>DISCUSSION: ASK THE STUDENTS TO DISCUSS WHETHER A TIRE’S TREAD WEAR RATING NUMBER HAS ANY RELATIONSHIP TO THE PRICE OF THE TIRE</u></p>

ICONS	Ch45 TIRES & WHEELS
	<p>ALIGNING A VEHICLE TO CORRECT FOR BAD TIRE WILL CAUSE PULL TO RETURN WHEN TIRES ARE ROTATED.</p>
	<p>43. SLIDE 43 EXPLAIN DOT Tire Code</p>
 <p>QUESTION</p>	<p>44. SLIDE 44 EXPLAIN Figure 45-18 Typical DOT date code. This tire was built the sixth week of 2005.</p> <p>DISCUSSION: ASK THE STUDENTS TO DISCUSS HOW IMPORTANT DOT DATE CODE IS WHEN DECIDING TO PURCHASE A TIRE.</p>
	<p>WHEN INSTALLING AFTERMARKET WHEELS USING NON-STOCK LUG NUTS, WIRE TIE A SET OF STOCK LUG NUTS TO THE SPARE TIRE WHEEL</p>
	<p>MANY TIRE MANUFACTURERS REQUIRE ONLY RETURNING THE DOT CODE OF THE TIRE FOR CLAIMS ON A WARRANTY. THIS SAVES SHIPPING COST.</p>
	<p>45. SLIDE 45 EXPLAIN Spare Tires</p>
	<p>BE SURE TO INCLUDE CHECKING SPARE TIRE MOUNTING HARDWARE AS PART OF A GENERAL SERVICE.</p>
	<p>46. SLIDE 46 EXPLAIN Run-Flat Tires</p> <p>47. SLIDE 47 EXPLAIN FIGURE 45-19 Cutaway of a run-flat tire showing the reinforced sidewalls and the required pressure sensor.</p>
	<p>48. SLIDE 48 EXPLAIN FIGURE 45-20 A conventional tire on the left and a run-flat tire on right, showing what happens when there is no air in the tire</p>
 <p>QUESTION</p>	<p>DISCUSSION: ASK STUDENTS TO DISCUSS ADVANTAGES AND DISADVANTAGES OF USING RUN-FLAT TIRES.</p>

ICONS	Ch45 TIRES & WHEELS
	HANDS-ON TASK: HAVE THE STUDENTS USE VISUAL CLUES TO IDENTIFY RUN-FLAT TIRES ON VEHICLES.
	49. SLIDES 49-50 EXPLAIN PAX run-flat tire
	51. SLIDE 51 EXPLAIN Figure 45-21 PAX run-flat tire system composed of 3 components: special asymmetrical wheel, urethane support ring, & special tire
	DEMONSTRATION: SHOW THE STUDENTS HOW TO READ AND INTERPRET THE <u>TIRE PERFORMANCE CRITERIA (TPC)</u>
	<u>SPECIFICATION NUMBER ON A TIRE STANDARD ON A GENERAL MOTORS VEHICLE.</u>
	HANDS-ON TASK: HAVE THE STUDENTS FIND TPC NUMBERS ON SEVERAL TIRES ON GM LAB OR PERSONAL VEHICLE
	53. SLIDE 53 EXPLAIN Tire Selection Considerations
	<u>DISCUSSION: HAVE THE STUDENTS DISCUSS WHY ROLLING RESISTANCE IS A CONCERN ON HYBRID VEHICLES.</u>
	54. SLIDES 54-55 EXPLAIN Wheels
	56. SLIDE 56 EXPLAIN Figure 45-23 The size of the wheel is usually cast or stamped into the wheel. This wheel is 7 inches wide. The letter “J” refers to the contour of the bead seat area of the wheel.
	57. SLIDE 57 EXPLAIN Figure 45-24 The wheel rim well provides a space for the tire to fit during mounting; the bead seat provides a tire-to-wheel sealing surface; the flange holds the beads in place.
	58. SLIDE 58 EXPLAIN Wheels
	59. SLIDE 59 EXPLAIN Figure 45-25 cross section of a wheel showing part designations.
	60. SLIDE 60 EXPLAIN Figure 45-26 Offset is distance between centerline of wheel and wheel mounting surface

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   	<p>61. SLIDE 61 EXPLAIN Figure 45-27 Back spacing (rear spacing) is the distance from the mounting pad to the edge of the rim. Most custom wheels use this measurement method to indicate the location of the mounting pad in relation to the rim</p> <p>DEMONSTRATION: SHOW THE STUDENTS EXAMPLES OF SEVERAL WHEELS AND EXPLAIN HOW TO DETERMINE THE SIZE OF WHEEL AND THE EXACT SHAPE OF FLANGE AREA.</p> <p>DISCUSSION: ASK THE STUDENTS TO DISCUSS WHY THE FLANGE AREA SHAPE AND THE ANGLE THAT THE RIM DROPS DOWN FROM THE FLANGE ARE IMPORTANT.</p> <p>HANDS-ON TASK: HAVE THE STUDENTS USE STICKY NOTES OR MASKING TAPE TO LABEL THE PARTS OF THE RIM.</p> <p>62. SLIDE 62 EXPLAIN Figure 45-28 Bolt circle is the diameter of a circle that can be drawn through the center of each lug hole or stud. The bolt circle is sometimes referred to as PCD for pitch circle diameter</p> <p>63. SLIDE 63 EXPLAIN Figure 45-29 Measuring the bolt circle on a five lug wheel is difficult, but a quick and easy way includes measuring as shown to determine the approximate bolt circle of a five-lug wheel</p>
   	<p>DEMONSTRATION: SHOW THE STUDENTS HOW TO USE A TAPE MEASURE TO DETERMINE APPROXIMATE BOLT CIRCLE OF A 5-LUG WHEEL, FIGURE 45-29</p> <p>HANDS-ON TASK: HAVE THE STUDENTS USE TAPE MEASURES TO DETERMINE THE APPROXIMATE BOLT CIRCLES OF FIVE-LUG WHEELS, FIGURE 45-29</p> <p>MOST TIRE SHOPS HAVE BOLT CIRCLE TEMPLATES. TEMPLATES HAVE SEVERAL BOLT CIRCLES ON THEM. THIS MAKES IT FASTER TO IDENTIFY A BOLT CIRCLE.</p> <p>64. SLIDE 64 EXPLAIN Figure 45-30 Measure center-to-center distance and compare the distance to the figures in the chart in the text to determine the diameter for a five-lug bolt circle</p>

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      	<p>65. SLIDE 65 EXPLAIN FIGURE 45-31 A typical JWL symbol for the Japan Wheel Light Metal standard mark.</p> <p>66. SLIDES 66-67 EXPLAIN TIRE VALVES</p> <p>68. SLIDE 68 EXPLAIN Figure 45-32 (a) A rubber snap-in style tire valve assembly. (b) A metal clamp-type tire valve assembly used on most high pressure (over 60 PSI) tire applications such as is found on many trucks, RVs, and trailers. The internal Schrader valve threads into the valve itself and can be replaced individually, but most experts recommend replacing the entire valve assembly every time the tires are replaced to help prevent air loss.</p> <p>RACERS QUOTE A 4:1 RATIO GAIN IN REMOVING UNSPRUNG WEIGHT. AS AN EXAMPLE, REMOVING 25 LB OF UNSPRUNG WEIGHT WOULD HAVE THE SAME EFFECT ON HANDLING AS REMOVING 100 LB OF SPRUNG WEIGHT.</p> <p>69. SLIDE 69 EXPLAIN Unsprung Weight</p> <p>70. SLIDE 70 EXPLAIN Figure 45-33 Various styles of lug nuts</p> <p>71. SLIDES 71-72 EXPLAIN Lug Nuts</p> <p>73. SLIDE 73 EXPLAIN LUG STUDS</p> <p>DEMONSTRATION: SHOW VARIOUS TYPES OF LUG NUTS AND EXPLAIN WHY THERE ARE DIFFERENT TYPES. FIGURE 45-33</p> <p>DISCUSSION: DISCUSS WHY SOME OEMS USE LUG NUTS AND OTHER MANUFACTURERS USE LUG BOLTS. FIGURE 45-33</p> <p>HANDS-ON TASK: HAVE THE STUDENTS INSPECT TIRES ON AN ASSIGNED VEHICLE.</p> <p>74. SLIDES 74-82 EXPLAIN <u>OPTIONAL TIRE INSPECTION</u></p> <p>NATEF MLR TASK A4A1 VB: RESEARCH APPLICABLE VEHICLE AND SERVICE INFORMATION, SUCH AS SUSPENSION AND STEERING SYSTEM OPERATION, VEHICLE HISTORY, SERVICE PRECAUTIONS, & TSBS_</p>

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	<p>SEARCH INTERNET HAVE THE STUDENTS SEARCH THE INTERNET TO RESEARCH THE PROCESS OF VULCANIZATION. ASK THEM TO PREPARE TO REPORT ON VULCANIZATION AND ITS IMPORTANCE TO THE AUTOMOTIVE INDUSTRY</p>