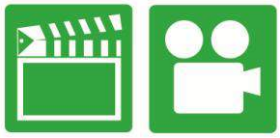
ATE5 Chapter 111 TIRE & WHEEL SERVICE

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class provides complete coverage of the components, operation, design, and troubleshooting. It correlates material to task lists specified by ASE and NATEF and emphasizes a problem-solving approach. Chapter features include Tech Tips, Frequently Asked Questions, Real World Fixes, Videos, Animations, and NATEF Task Sheet references.
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. State the importance of proper tire inflation. 2. Discuss proper tire mounting procedures. 3. Discuss radial runout and lateral runout. 4. Discuss how to balance wheel and tire assembly (static and dynamic). 5. Explain the factors to be considered while replacing wheels and the procedure to repair tires.
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 the 5th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com

LINK CHP 111: ATE5 Chapter Images

ICONS	Chapter 111 Tire & Wheel Service
	1. **SLIDE 1 CH111 TIRE AND WHEEL SERVICE** 2. **SLIDE 2 EXPLAIN Figure 111-1** Using soapy water from a spray bottle is an easy method to find the location of an air leak from a tire.
	**Check for ADDITIONAL VIDEOS & ANIMATIONS @** **http://www.jameshalderman.com/** **WEB SITE IS CONSTANTLY UPDATED**
	**Videos**
	3. **SLIDE 3 EXPLAIN Figure 111-2** chart shows the relationship between tire inflation pressure and load capacity of the tire. 4. **SLIDE 4 EXPLAIN Figure 111-3** chart shows that a drop in inflation pressure has a major effect on fuel economy. 5. **SLIDE 5 EXPLAIN Figure 111-4** Notice that if a tire is underinflated by10 PSI, life expectancy is reduced by 40%
	**DEMONSTRATION: Show the students how to use a spray bottle containing soapy water to check for the location of an air leak in a tire.**
 	**DISCUSSION: Ask the students to discuss reasons for not overinflating tires.**
 	**ON-VEHICLE NATEF TASK: Inspect tire condition and check for loss of air pressure. P333**
	**DEMONSTRATION: Show students an example of a temporary inflation pump and show how it is used. FIGURE 111-5**
	**DEMONSTRATION: Show students an aerosol can of sealer that is provided as standard equipment on vehicles not equipped with conventional spare tires. FIGURE 111-6**

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	7. **SLIDE 7 EXPLAIN FIGURE 111-6** Many vehicle manufacturers include aerosol can of sealer on vehicles that are not equipped with conventional spare tire. 8. **SLIDE 8 EXPLAIN Figure 111-7** Most shops that use nitrogen inflation install a green tire value cap to let others know that nitrogen, rather than air has been used to inflate the tire.
	**DISCUSSION: Ask the students to discuss whether inflating tires with nitrogen is really necessary.**
	9. **SLIDE 9 EXPLAIN Figure 111-8** Note the difference in the shape of the rim contour of the 16-in. and 16 1/2-in. diameter wheels. While it is possible to mount a 16-in. tire on a 16 1/2-in. rim; it cannot be inflated enough to seat against the rim flange. If an attempt is made to seat the tire bead by overinflating (over 40 PSI), the tire bead can break, resulting in an explosive force that could cause serious injury or death. 10. **SLIDE 10 EXPLAIN Figure 111-9** When installing a tire-pressure monitoring system sensor, be sure that flat part of sensor is parallel to the center section of rim.
	**DEMONSTRATION: Show the students how to install a tire-pressure monitoring system (TPMS) sensor. FIGURE 111-9**
	11. **SLIDE 11 EXPLAIN Figure 111-10** This tire on a new vehicle has been match mounted at the factory. The yellow sticker is placed at the largest diameter of the tire. The valve core hole in the wheel is usually drilled at the smallest diameter of the wheel. The best way to make sure the assembly is as round as possible and to reduce the number of wheel weights needed to balance the tire is to align the sticker with the valve core. 12. **SLIDE 12 EXPLAIN Figure 111-11 (a)** Cleaning the bead area of an aluminum (alloy) wheel using a handheld wire brush. The technician is using the tire changer itself to rotate the wheel as the brush is used to remove any remnants of the old tire.
	**DEMONSTRATION: Show the students how to correctly use an air powered wire brush to clean the bead area of a wheel. FIGURE 111-11**

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	13. **SLIDE 13 EXPLAIN Figure 111-11 (b)** Using an electric or air-powered wire brush speeds the process, but care should be exercised not to remove any of the aluminum itself. (Remember, steel is harder than aluminum and a steel wire brush could cause recesses to be worn into the aluminum wheel, which would prevent the tire from proper seating in the bead area.) The bead seat area on steel wheels should also be cleaned to prevent air leaks at the rim. 14. **SLIDE 14 EXPLAIN Figure 111-12** Rendered (odorless) animal fat is recommended by some manufacturers of tire changing equipment for use as a rubber lubricant.
	**DISCUSSION: Ask students to discuss how a rim leak on a new set of tires could affect a shop's reputation**.
	15. **SLIDE 15 EXPLAIN Figure 111-13** Always tighten wheel lug nuts (or studs) in a star pattern to ensure even pressure on the axle flange, brake rotors or drums, and the wheel itself.
	**DEMONSTRATION: Show the students how to properly tighten lug nuts by using a star pattern. FIGURE 111-13**
	**DISCUSSION: Ask the students to discuss possible results of tightening lug nuts in the wrong sequence. FIGURE 111-13**
	**Remove and Replace Tire & Wheel (View) (Download)** **Tire Rotation (View) (Download)** **Tire Rotation, FWD Vehicle (View) (Download)**
	16. **SLIDE 16 EXPLAIN Figure 111-14** Most manufacturers recommend using hand tools rather than an air impact wrench to remove and install locktype lug nuts to prevent damage. If either the key or the nut is damaged, the nut may be very difficult to remove. 17. **SLIDE 17 EXPLAIN Figure 111-15** torque-limiting adapter (torque stick) for use with an air impact wrench still requires care to prevent overtightening. The air pressure to the air impact should be limited to 125 PSI (860 kPa) in most cases, and the proper adapter must be selected for the vehicle being serviced. The torque adapter absorbs any torque beyond its designed rating.

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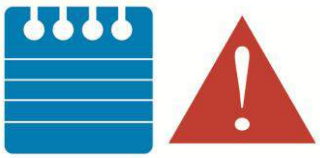
	Most adapters are color coded for easy identification as to the size of lug nut and torque value.
	**DEMONSTRATION: Show the students examples of lug nuts and anti-theft lug nuts.** **FIGURE 111-14**
	**DEMONSTRATION: Show the students some examples of color-coded torque-limiting adapters.** **FIGURE 111-15**
	**SAFETY NOTE: Using torque-limiting adapters to remove lug nuts can cause adapters to fail, causing injury**
	**ON-VEHICLE NATEF TASK: Diagnose vibration and pull concerns; determine necessary action.** **Page 334**
	18. **SLIDE 18 EXPLAIN Figure 111-16** This wheel was damaged because the lug nuts were not properly torqued. 19. **SLIDE 19 EXPLAIN Figure 111-17** The method most often recommended is the modified X method. Using this method, each tire eventually is used at each of the four wheel locations. An easy way to remember the sequence, whether front wheel drive or rear wheel drive, is to say to yourself, "Drive wheels straight, cross the non-drive wheels."
	**DISCUSSION: Ask students to discuss why modified-X method of rotating tires is recommended method. Ask students to discuss why some OEMS do not recommend rotating tires.**
	**ON-VEHICLE NATEF TASK: Rotate tires according to manufacturer's Recommendations.** **Page 335**
	**ON-VEHICLE NATEF TASK: Reinstall wheel; torque lug nuts. Page 337**
	**SEARCH INTERNET: search Internet to research temporary mobility kits. Ask the students to prepare a short report on what they are, their advantages/disadvantages, and list of automobiles that have them as standard equipment.**

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	20. **SLIDE 20 EXPLAIN Figure 111-18** Tire showing excessive shoulder wear resulting from underinflation and/or high-speed cornering. 21. **SLIDE 21 EXPLAIN Figure 111-19** Tire showing excessive wear in the center, indicating overinflation or heavy acceleration on a drive wheel. 22. **SLIDE 22 EXPLAIN Figure 111-20** Wear on outside shoulder only is an indication of an alignment problem.
	**Replace Wheel Stud (View) (Download)** **Tighten Lug Nuts (View) (Download)**
	23. **SLIDE 23 EXPLAIN Figure 111-21** A tire runout gauge being used to measure the radial runout of a tire. 24. **SLIDE 24 EXPLAIN Figure 111-22** To check wheel radial runout, the dial indicator plunger tip rides on a horizontal surface of the wheel, such as the bead seat.
	**DEMONSTRATION: Show the students how to use a runout gauge to check lateral & RADIAL runout. FIGURE 111-21**
	**DEMONSTRATION: Show how to measure wheel runout by taking dial indicator readings on inside of wheel rim. FIGURE 111-22**
	25. **SLIDE 25 EXPLAIN Figure 111-23** To check lateral runout, the dial indicator plunger tip rides on a vertical surface of the wheel, such as the wheel flange. 26. **SLIDE 26 EXPLAIN Figure 111-24** most accurate method of measuring wheel runout is to dismantle the tire & take dial indicator readings on inside of wheel rim
	**HANDS-ON TASK: Have students use tire runout gauges to measure radial runout of 2 different tires.**
	**ON-VEHICLE NATEF TASK: Measure wheel, tire, axle flange, and hub runout; determine necessary action. Page 336**
	**DISCUSSION: Ask the students to discuss symptoms of tires with excessive runout.**

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	27. **SLIDE 27 EXPLAIN Figure 111-25** wheel balancer detects heavy spots on the wheel and tire, and indicate where to place weight to offset both static and dynamic imbalance.
	**DISCUSSION: Ask the students to discuss when the use of liquid tire stop leak would be recommended.**
	**DISCUSSION: Ask the students to discuss whether tires should be balanced based on a mileage schedule or only if they exhibit problems.**
	**DISCUSSION: Ask the students to discuss customer complaints due to tire imbalance.**
	28. **SLIDE 28 EXPLAIN Figure 111-26** assortment of wheel weights designed to fit different shaped rims. 29. **SLIDE 29 EXPLAIN FIGURE 111-27** Liquid tire stop leak was found in all four tires. 30. **SLIDE 30 EXPLAIN Figure 111-28** Stick-on weights are used from the factory to balance the alloy wheels of this Prowler. 31. **SLIDE 31 EXPLAIN Figure 111-29** Wheel weight pliers designed to remove and install wheel weights.
	**DEMONSTRATION: Show the students examples of wheel weights used for variously shaped rims.**
	**DISCUSSION: Ask the students to discuss the proper number of weights to use on a tire.**
	**DEMONSTRATION: Show how to use wheel weight pliers. Show how to remove a tire valve by using a tire valve remover.**
	**HANDS-ON TASK: Have the students remove and install wheel weights by using wheel weight pliers.**
	32. **SLIDE 32 EXPLAIN Figure 111-30** A tire balancer that can also detect radial and lateral force variation and instruct the operator where to rotate the tire to achieve the best ride, or indicate a bent wheel.

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	**HANDS-ON TASK:** Have the students perform the **Prebalance Checks** outlined on pgs 1278–1279.
	**HANDS-ON TASK:** Have the students remove tire valves by using tire valve removers & **balance a set of tires.**
	**ON-VEHICLE NATEF TASK** Dismount and remount tire on wheel; balance. **Page 338**
	**DISCUSSION:** Ask the students to discuss possible effects on a tire if the tire's bead seat is not cleaned properly before tire is installed.
	33. **SLIDE 33 EXPLAIN Figure 111-31** Most brake drums do not have this much attached weight 34. **SLIDE 34 EXPLAIN FIGURE 111-32** Notice that the rim touches the tie rod end 35. **SLIDE 35 EXPLAIN FIGURE 111.33A** hubcentric plastic ring partially removed from aftermarket wheel 36. **SLIDE 36 EXPLAIN FIGURE 111.33B** hubcentric plastic ring left on the hub when removing a wheel 37. **SLIDE 37 EXPLAIN Figure 111-34** area of the repair should be buffed slightly larger than patch to be applied. 38. **SLIDE 38 EXPLAIN Figure 111-35** stitching tool being used to force any trapped air out from under the patch. 39. **SLIDE 39 EXPLAIN Figure 111-36** rubber plug being pulled through a hole in the tire. The stem is then cut off flush with the surface of the tire tread.
	
	**DEMONSTRATION:** Show the students examples of various tire repair products, then show students how to apply a plug patch when repairing a tire.
	**ON-VEHICLE NATEF TASK** Repair tire using internal patch. **Page 339**
	40. **SLIDES 40-57 OPTIONAL EXPLAIN TIRE MOUNTING**

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  	58. SLIDES 58-69 OPTIONAL EXPLAIN TIRE REPAIR **SEARCH INTERNET: Have the students search the Internet for tire manufacturers' recommendations for tire repairs.** **Crossword Puzzle (Microsoft Word) (PDF)** **Word Search Puzzle (Microsoft Word) (PDF)**