Automotive Steering, Suspension, & Alignment 7e
Chapter 20 Vibration & Noise Diagnosis & Correction
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.	Explain learning objectives to students as listed below: 1. List the possible vehicle components that can cause a vibration or noise. 2. Explain the vibration speed ranges and the method to determine the frequency of the vibration. 3. Discuss the methods for measuring driveshaft U-joint phasing and balancing the driveshaft. 4. Diagnose and correct noise problems. **This chapter will help you prepare for Suspension and Steering (A4) ASE certification test content area "C" (Related Suspension and Steering 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 Steering, Suspension, & Alignment 7th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com
LINK CHP 20:

ICONS	Chapter 20 Vibration & Noise Diagnosis
	1. **SLIDE 1 CH20 VIBRATION & NOISE DIAGNOSIS & CORRECTION**
	**Check for VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/** **WEB SITE IS CONSTANTLY UPDATED**
	**Video 1 Drive Axle Flange Runout**
	**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**
	
	2. **SLIDE 2 EXPLAIN FIGURE 20.1** Many vehicles, especially those equipped with four-cylinder engines, use a dampener weight attached to exhaust system or differential, as shown, to dampen out certain frequency vibrations. 3. **SLIDE 3 EXPLAIN FIGURE 20.2** The exhaust was found to be rubbing on the frame rail during a visual inspection.
	**Tire Lateral Runout (View)** **Tire Radial Runout (View)**
	**DEMONSTRATION: Show examples of**
	**A typical exhaust system can "grow" or lengthen up to 2 inch (1 cm) when warm, as compared with room temperature. Always inspect an exhaust system when warm, if possible, being careful to avoid being burned by the hot exhaust components.**
	**Become familiar with servicing procedures for driveshafts to correct vibrations, booms, rear end noise**

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	4. **SLIDE 4 EXPLAIN FIGURE 20.3** A chart showing the typical vehicle and engine speeds at which various components will create a noise or vibration and under what conditions. 5. **SLIDE 5 EXPLAIN FIGURE 20.4** Vibration created at one point is easily transferred to the passenger compartment. MacPherson strut suspensions are more sensitive to tire imbalance than SLA-type suspensions.
	**If engine or transmission has been removed from the vehicle, such as during a clutch replacement, carefully observe the location and condition of the mounts. If an engine or transmission mount is defective or out of location, engine and driveline vibrations are often induced and transmitted throughout the vehicle.**
	6. **SLIDE 6 EXPLAIN FIGURE 20.5** Hertz means *cycles* per *second*. If six cycles occur in one second, then the frequency is 6 Hz. The amplitude refers to the total movement of the vibrating component. 7. **SLIDE 7 EXPLAIN FIGURE 20.6** Every time the end of a clamped yardstick moves up and down, it is one cycle. The number of cycles divided by the time equals the frequency. 8. **SLIDE 8 EXPLAIN FIGURE 20.7** Determining the rolling circumference of a tire. 9. **SLIDE 9 EXPLAIN FIGURE 20.8** An electronic vibration analyzer. 10. **SLIDE 10 EXPLAIN FIGURE 20.9** Properly balancing all wheels and tires solves most low-frequency vibrations. 11. **SLIDE 11 EXPLAIN FIGURE 20.10** An out-of-balance tire showing scallops or bald spots around the tire. Even if correctly balanced, this cupped tire would create a vibration. 12. **SLIDE 12 EXPLAIN FIGURE 20.11** Another cause of a vibration that is often blamed on wheels or tires is a bent bearing hub. Use a dial indicator to check flange for runout.
	**ON-VEHICLE NATEF TASK Diagnose noise, vibration, and unusual steering concerns; determine necessary action**
	
	**ON-VEHICLE NATEF TASK Measure drive axle flange runout and shaft end play; determine necessary action.**

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	**DISCUSSION:** Discuss importance of marking U-joint components before disassembly. Discuss various ways to mark U-joint orientation before disassembly. Could installing the driveshaft out of phase cause a vibration and if so why?
	13. **SLIDE 13 EXPLAIN FIGURE 20.12** When checking the balance of a driveshaft, make reference marks around the shaft so that the location of the unbalance may be viewed when using a strobe light. 14. **SLIDE 14 EXPLAIN FIGURE 20.13** Using a strobe balancer to check for driveline vibration requires that an extension be used on the magnetic sensor. 14. **SLIDE 15 EXPLAIN FIGURE 20.14** Typical procedure to balance a driveshaft using hose clamps.
	16. **SLIDE 16 EXPLAIN FIGURE 20.15** Two clamps were required to balance this front driveshaft of a four-wheel-drive vehicle. 17. **SLIDE 17 EXPLAIN FIGURE 20.16** Tire wear caused by improper alignment or driving habits, such as high-speed cornering, can create tire noise. Notice feather-edged outer tread blocks. 18. **SLIDE 18 EXPLAIN FIGURE 20.17** This bearing was found on a vehicle that had been stored over the winter. This corroded bearing produced a lot of noise and had to be replaced. 19. **SLIDE 19 EXPLAIN FIGURE 20.18** Chassis ear microphones attached to various suspension components using the integral clamps.
	**DEMONSTRATION:** Show example of inclinometer tool and explain how it works to measure drive line angles
	**DEMONSTRATION:** DEMO how to check driveshaft balance and how to measure and adjust driveline angles
	**ON-VEHICLE NATEF TASK** Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles.

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