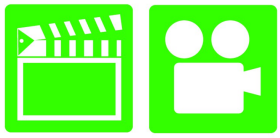
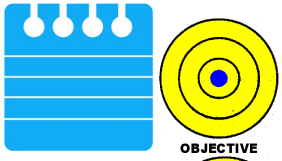
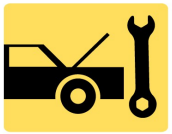
A8 Engine Performance 4th Edition

Chapter 11 Variable Valve Timing

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of **Automotive Engine Performance.** 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. Prepare for Engine repair (A1) ASE certification test content area "D" (Lubrication and Cooling Systems Diagnosis and Repair). 2. Describe how coolant flows through an engine. 3. Discuss the operation of the thermostat. 4. Explain the purpose and function of the radiator pressure cap. 5. Describe the various types of antifreeze and how to recycle and discard used coolant. 6. Discuss how to diagnose cooling system problems.
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.

ICONS	Ch11 Variable Valve Timing
	1. SLIDE 1 CH8 11 Variable Valve Timing
	Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/ WEB SITE REGULARLY UPDATED
	POWER POINTS DONE BY INDIVIDUAL LEARNING OBJECTIVES, SO THERE IS POWER POINT FILE FOR EACH LEARNING OBJECTIVE
	2. SLIDE 2 EXPLAIN OBJECTIVE CH11 AEP_LO1 3. SLIDES 3-4 EXPLAIN Purpose of Variable Valve Timing 5. SLIDES 5-6 EXPLAIN Parts and Operation 7. SLIDE 7 EXPLAIN Figure 11-1 Camshaft rotation during advance and retard.
	2. SLIDE 2 EXPLAIN OBJECTIVE CH11 AEP_LO2 3. SLIDES 3-4 EXPLAIN OHV Variable Timing
	5. SLIDE 5 EXPLAIN Figure 11-2 camshaft is rotated in relation to the crankshaft by the PCM to provide changes in valve timing. 6. SLIDE 6 EXPLAIN OHV Variable Timing 7. SLIDE 7 EXPLAIN Spline Phaser System 8. SLIDE 8 EXPLAIN Figure 11-3 Spline cam phaser assembly
	DEMONSTRATION: SHOW AN EXAMPLE OF A CAMSHAFT POSITION ACTUATOR OIL CONTROL VALVE.
	HANDS-ON TASK: HAVE STUDENTS SEARCH SERVICE INFORMATION TO DETERMINE WHAT CONTROLS CAMSHAFT POSITION ACTUATOR OIL CONTROL VALVE.
	DISCUSSION: ASK THE STUDENTS TO DISCUSS THE ADVANTAGES OF INTAKE AND EXHAUST CAMSHAFT PHASING.

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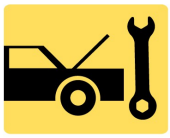
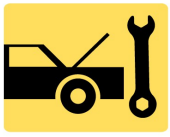
	**CONTROL SOLENOID SCREEN CAN BECOME PLUGGED IF THE OIL IS NOT CHANGED REGULARLY. THIS CAN CAUSE CHANGES IN PERFORMANCE AND EMISSIONS.**
	9. **SLIDE 9 EXPLAIN Figure 11-4** Spline phaser. 10. **SLIDE 10 EXPLAIN FIGURE 11–5** The screen(s) protect the solenoid valve from dirt and debris that can cause the valve to stick. This fault can set a **P0017** diagnostic trouble code (crankshaft position–camshaft position correlation error). 11. **SLIDE 11 EXPLAIN OHV Variable Timing** 12. **SLIDE 12 EXPLAIN Figure 11-6** vane phaser is used to move the camshaft, using changes in oil pressure from the oil control valve. 13. **SLIDE 13 EXPLAIN Figure 11-7** A camshaft position actuator used in a cam-in-block engine.
	**DEMONSTRATION: USING SCAN TOOL & VEHICLE EQUIPPED WITH VARIABLE VALVE TIMING, SHOW WHAT VARIABLE VALVE TIMING DATA CAN BE OBSERVED USING THE SCAN TOOL.**
	**HANDS-ON TASK: FOR A VEHICLE THAT USES VARIABLE VALVE TIMING, HAVE THE STUDENTS USE SERVICE INFORMATION TO READ A DESCRIPTION OF THE VARIABLE VALVE TIMING AND HOW IT IS CONTROLLED ON THAT VEHICLE.**
	**DEMONSTRATION: SHOW AN EXAMPLE OF A VANE PHASER SYSTEM, IF ONE IS AVAILABLE.**
	**HANDS-ON TASK: HAVE THE STUDENTS USE SERVICE INFORMATION TO RESEARCH THE ROLE THAT THE PCM PLAYS IN ACTIVATION OF THE VARIABLE VALVE CONTROLS.**
	**ON-VEHICLE NATEF TASK ESTABLISH CAMSHAFT POSITION SENSOR INDEXING.**
	**ANIMATION: VARIABLE VALVE TIMING** **WWW.MYAUTOMOTIVELAB.COM** HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYAUTOMOTIVELAB_2/ANIMATIONS/A1_ANIMATION/CHAPTER28_FIG_28_48/INDEX.HTM

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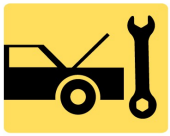
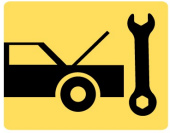
	14. **SLIDES 14-15 EXPLAIN** Variable Valve Timing and Lift 16. **SLIDE 16 EXPLAIN Figure 11-10** plastic mockup of a Honda VTEC system that uses two different camshaft profiles—one for low-speed engine operation and the other for high speed. 17. **SLIDE 17 EXPLAIN Figure 11-11** Engine oil pressure is used to switch cam lobes on a VTEC system. 18. **SLIDE 18 EXPLAIN FIGURE 11–12** A typical variable cam timing control valve. The solenoid is controlled by the engine computer and directs engine oil pressure to move a helical gear, which rotates the camshaft relative to the timing chain sprocket. 19. **SLIDE 19 EXPLAIN** Computer Control of Variable Valve Timing 20. **SLIDE 20 EXPLAIN FIGURE 11–13** schematic of a variable valve timing control circuit, showing that battery power (+) is being applied to the variable valve timing (VVT) solenoid and pulsed to ground by PCM. **EXPLAIN FIGURE 11–14** A variable valve timing solenoid being controlled by applying voltage from PCM
	**HANDS-ON TASK: FOR A VEHICLE WITH VARIABLE TIMING, HAVE STUDENTS' LIST PCM CODES THAT ARE ASSOCIATED WITH THE VARIABLE VALVE TIMING SYSTEM.**
	**DEMONSTRATION: USING A SCAN TOOL, SHOW HOW PWM IS USED TO CONTROL THE ACTUATOR SOLENOID.**
	**HANDS-ON TASK: HAVE STUDENTS USE SERVICE INFORMATION TO RESEARCH VTEC SYSTEM USED BY HONDA.**
	**DEMONSTRATION: SHOW SOME EXAMPLES OF CAMSHAFT POSITION SENSORS.**
	**DEMONSTRATION: SHOW SOME EXAMPLES, IF AVAILABLE, OF CYLINDER DEACTIVATION CONTROLS USED BY VARIOUS OEMS.**

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	**DISCUSSION: ASK THE STUDENTS TO DISCUSS THE MAIN PURPOSE OF CYLINDER DEACTIVATION. (ANSWER: FUEL ECONOMY.)** 2. SLIDE 2 EXPLAIN **OBJECTIVE CH11 AEP_LO3** 3. **SLIDES 3-5 EXPLAIN** Diagnosis of Variable Valve Timing Systems