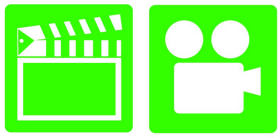
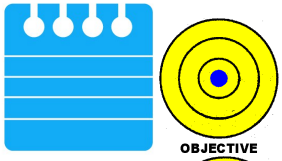
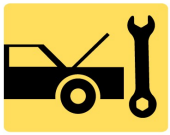
A8 Engine Performance 4th Edition

Chapter 14 In-Vehicle Engine Service

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 ASE certification test content area "A" (General Engine Diagnosis). 2. Diagnose and replace the thermostat. 3. Diagnose and replace the water pump. 4. Diagnose and replace an intake manifold gasket. 5. Determine and verify correct cam timing. 6. Replace a timing belt. 7. Describe how to adjust valves. 8. Explain hybrid engine precautions
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	Ch14 In-Vehicle Engine Service
	1. SLIDE 1 CH14 In-Vehicle Engine Service
	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 CH14 AEP_LO1 3. SLIDE 3 EXPLAIN Thermostat Replacement
	4. SLIDE 4 EXPLAIN FIGURE 14–1 A stuck-open thermostat. This caused the vehicle to set a diagnostic trouble code P0128 (coolant temperature below thermostat regulating temperature). 5. SLIDES 5-9 EXPLAIN Thermostat Replacement: Replacement Procedure
	RUNNING ENGINE WITHOUT THERMOSTAT COULD CAUSE OVERHEATING. COOLANT FLOWS TOO FAST TO ALLOW RADIATOR TIME TO REMOVE HEAT.
	HANDS-ON TASK: HAVE STUDENTS BENCH TEST A THERMOSTAT
	DEMONSTRATION: SHOW HOW TO BURP (PURGE) AIR FROM A COOLING SYSTEM.
	2. SLIDE 2 EXPLAIN OBJECTIVE CH14 AEP_LO2 3. SLIDES 3-6 EXPLAIN Water Pump Replacement
	7. SLIDE 7 EXPLAIN Figure 14-2 Use caution if using a steel scraper to remove a gasket from aluminum parts. It is best to use a wood or plastic scraper.

ICONS	Ch14 In-Vehicle Engine Service
	WATER PUMP WEEP HOLE LEAKS WILL SOMETIMES LEAK ONLY HOT OR COLD
	ON-VEHICLE HANDS-ON TASK: HAVE STUDENTS INSPECT WATER PUMP. INSPECTIONS SHOULD INCLUDE: BEARINGS, LEAKS, FLOW.
	AFTER WATER PUMP REPLACEMENT, COOLING SYSTEM SHOULD BE FILLED AND PRESSURED AS SOON AS POSSIBLE. THIS WILL ENABLE YOU TO FIND ANY LEAKS BEFORE JOB IS COMPLETED.
OBJECTIVE	2. **SLIDE 2 EXPLAIN OBJECTIVE CH14 AEP_LO3** 3. **SLIDES 3-4 EXPLAIN** Intake Manifold Gasket Inspection
	5. **SLIDES 5 EXPLAIN FIGURE 14-3** intake manifold gasket that failed and allowed coolant to be drawn into the cylinder(s). 6. **SLIDE 6 EXPLAIN** Intake Manifold Gasket Inspection: Diagnose Leaking Intake Manifold Gasket 7. **SLIDES 7-8 EXPLAIN** Intake Manifold Gasket Inspection
	9. **SLIDE 9 EXPLAIN Figure 14-4** The lower intake manifold attaches to the cylinder heads. 10. **SLIDE 10 EXPLAIN Figure 14-5** The upper intake manifold, often called a plenum, attaches to the lower intake manifold. 11. **SLIDES 11-12 EXPLAIN** Intake Manifold Gasket Replacement 13. **SLIDES 13 EXPLAIN Figure 14-6** Many aftermarket replacement intake manifolds have a different appearance from the original manifold. 14. **SLIDES 14-15 EXPLAIN** Intake Manifold Gasket Replacement
DEMO	**DEMONSTRATION: SHOW STUDENTS HOW TO USE TORQUE WRENCH TO TIGHTEN AN INTAKE MANIFOLD.**
	ON-VEHICLE HANDS-ON TASK: HAVE STUDENTS R&R AN INTAKE MANIFOLD GASKET, USING THE CORRECT PROCEDURE

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	2. SLIDE 2 EXPLAIN **OBJECTIVE CH14 AEP_LO4** 3. **SLIDES 3-6 EXPLAIN** Timing Belt Replacement: Timing Belt Replacement Guidelines
	7. **SLIDE 7 EXPLAIN FIGURE 14–7** A single overhead camshaft engine with a timing belt that also rotates the water pump.
	**MOST OVERHEAD CAM (OHC) ENGINES USED TODAY ARE NOT FREE RUNNING. THIS MEANS THAT ENGINE DAMAGE CAN OCCUR IF TIMING BELT BREAKS. THIS DAMAGE COULD BE BENT VALVES, DAMAGED VALVE SEATS, PISTONS, ETC. ALWAYS ROTATE AN ENGINE BY HAND TO VERIFY TIMING. IF ANY BINDING IS FELT, STOP! THIS COULD MEAN THAT VALVES ARE HITTING PISTONS.**
	
	**ON-VEHICLE NATEF TASK: INSPECT AND REPLACE CAMSHAFT & DRIVE BELT/CHAIN**
	**DIGITAL PHOTOGRAPHS TAKEN BEFORE DISASSEMBLY FOR VALVE ADJUSTMENT CAN SAVE TIME WHEN REASSEMBLING**
	2. SLIDE 2 EXPLAIN **OBJECTIVE CH14 AEP_LO5** 3. SLIDES 3-8 EXPLAIN Timing Belt Replacement: Need for Replacement
	2. SLIDE 2 EXPLAIN **OBJECTIVE CH14 AEP_LO6** 3. SLIDES 3-26 EXPLAIN **VALVE ADJUSTMENT PROCEDURE**
	**ON-VEHICLE NATEF TASK: ADJUST VALVES (MECHANICAL OR HYDRAULIC LIFTERS)**

ICONS	Ch14 In-Vehicle Engine Service
  	**DISCUSSION: ASK STUDENTS WHY IT IS IMPORTANT TO USE CORRECT TORQUE SEQUENCE AND TORQUE VALUES.** 2. **SLIDE 2 EXPLAIN OBJECTIVE CH14 AEP_LO7** 3. **SLIDES 3-4 EXPLAIN Hybrid Engine Precautions: Hybrid Vehicle Engine Operation** 5. **SLIDES 5-6 EXPLAIN** Hybrid Engine Precautions 7. **SLIDE 7 EXPLAIN FIGURE 14–8** Toyota/Lexus hybrid electric vehicle has a ready light. If the ready light is on, the engine can start at any time without warning. 8. **SLIDE 8 EXPLAIN** Hybrid Engine Precautions