Automotive Engines
Chapter 35 ENGINE INSTALLATION & BREAK-IN
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 the chapter learning objectives to the students as listed on the NEXT SLIDE. 1. Prepare for ASE Engine Repair (A1) certification test content area "E" (Fuel, Electrical, Ignition, and Exhaust System Inspection and Service). 2. List the steps necessary to install and start up a rebuilt engine. 3. Discuss the importance of torquing all bolts or fasteners that connect accessories to the engine block. 4. Describe what precautions must be taken to prevent damage to the engine when it is first started. 5. Explain how to break in a newly rebuilt engine.
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	Ch35 Installation & Start-up
	1. SLIDE 1 CH35 ENGINE INSTALLATION & BREAK-IN 2. **SLIDE 2-3** EXPLAIN **Objectives & KEY TERMS** 4. **SLIDES 4-6** EXPLAIN Preinstallation Checklist
	**Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/** **WEB SITE IS UPDATED REGULARLY**
	**DISCUSSION: Ask students to discuss parts that should already have been replaced when installing an engine. Some examples are spark plugs, gaskets, and spark plug wires.**
	**DEMONSTRATION: Show how to inspect and find damaged or worn parts before an engine is to be installed. Examples include cracked or damaged hoses, damaged core plugs (freeze plugs), and other components.**
	**HANDS-ON TASK: Install some damaged or worn parts on an engine. Have students inspect engine to see if they can properly locate & identify bad parts.**
	7. **SLIDE 7** EXPLAIN **FIGURE 35–1** partially melted electrical connector indicates that excessive current flow was present. The cause of the excessive current should be located and corrected before the engine is started 8. **SLIDES 8-9** EXPLAIN Transmission Installation 10. **SLIDE 10** EXPLAIN **FIGURE 35-2** Bell housing alignment dowel pins are used to ensure proper alignment between block and transmission.
	11. **SLIDE 11** EXPLAIN TECH TIP
	12. **SLIDE 12** EXPLAIN TECH TIP **FIGURE 35-3** Headless long bolts can be used to help install a transmission to the engine.
	
	**Many parts suppliers have clutch kits that include a pressure plate, a disc, & related hardware. Do not forget that machining the flywheel is an important step.**

ICONS	Ch35 Installation & Start-up
	**DISCUSSION:** Have students discuss other tips they could use to help install an engine.
	**SAFETY** weight of the engine & transmission can exceed 1,000 pounds. Never let the assembly rest on any part of the vehicle that could be damaged, such as a fender, radiator, or other components. Never go under the engine while it is being supported with just the hoist.
	13. SLIDE 13 EXPLAIN **TRANSMISSION INSTALLATION**
	14. SLIDE 14 EXPLAIN **FIGURE 35-4** The internal splines inside the torque converter must be properly aligned with all of the splines of the automatic transmission.
	**When installing automatic transmission, make sure that torque converter is properly seated in the front pump. If engine is started & converter is not seated properly, it could damage pump and torque converter.**
	15. SLIDE 15 EXPLAIN Dressing Engine
	16. SLIDE 16 EXPLAIN **FIGURE 35-5** It is often easier to install all of the accessory drive belts before the engine is installed in the vehicle
	17. SLIDE 17 EXPLAIN Engine Installation
	18. SLIDE 18 EXPLAIN **FIGURE 35-6** fixture installed that is used as a place to attach the hosting chains.
	19. SLIDE 19 EXPLAIN FREQUENTLY ASKED QUESTION
	**DEMONSTRATION:** Show difference between good engine coolant & bad engine coolant. Have containers of both on hand to show them difference. With an installed engine, new coolant should always be used.

ICONS	Ch35 Installation & Start-up
	**Some engines may need to be cranked longer because they use hydraulic lifters that need to be pressurized before they properly open the valves.**
	**20. SLIDES 20 EXPLAIN ENGINE START & EXPLAIN FIGURE 35-7** Even though the dash gauge may show normal operating temperature, a scan tool or an infrared pyrometer can also be used to verify proper coolant temperature.
	21. SLIDE 21 EXPLAIN Break-In Precautions
	**DISCUSSION: Ask students to discuss the role of computers in engine replacement in a modern vehicle.**
	**DEMONSTRATION: Using a factory scan tool, show students how to program an Engine Computer Module. It may be necessary to do this when installing an engine so the computer can operate properly.**
	**ON-VEHICLE NON-NATEF TASK Remove and install engine**
	**DEMONSTRATION: Show students how to properly run an OBD-II drive cycle using a scan tool. If the vehicle does not pass, the customer cannot get an emissions sticker in most states.**
	**Talk through SUMMARY and questions**
	**HOMEWORK: complete Ch35 crossword puzzle: http://www.jameshalderman.com/links/book_engine_theory_serv_7/cw/crossword_ch_35.pdf**