Automotive Technology 6th Edition
Chapter 8 Fasteners & Thread Repair
Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This Automotive Technology 6th text provides complete coverage of automotive components, operation, design, and troubleshooting. It correlates material to task lists specified by ASE and ASEEducation (NATEF) and emphasizes a problem-solving approach. Chapter features include Tech Tips, Frequently Asked Questions, Case Studies, Videos, Animations, and ASEEducation (NATEF) Task Sheets.
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: 1. Identify bolts and explain the strength ratings of threaded fasteners. 2. Discuss the purpose of nuts, taps, dies, and washers. 3. Discuss how snap rings and clips are used. 4. Explain how to avoid broken fasteners. 5. Compare the different types of thread repair inserts.
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 6th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com

DOWNLOAD Chapter 8 Chapter Images: From

http://www.jameshalderman.com/automotive_principles.html

NOTE: You can use Chapter Images or possibly Power Point files:

ICONS	Ch8 Fasteners & Thread Repair
	**1. SLIDE 1 FASTENERS & THREAD REPAIR**
	**Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/** **WEB SITE IS CONSTANTLY UPDATED**
	**VIDEO: THREAD REPAIR** **HTTP://YOUTU.BE/OV_XWKWKJBU**
	**http://www.jameshalderman.com/automotive_principles.html** **DOWNLOAD** **Crossword Puzzle (Microsoft Word) (PDF)** **Word Search Puzzle (Microsoft Word) (PDF**
	**USE ANIMATION** **BOLT SIZE (VIEW) (DOWNLOAD)** **BOLT THREADS (VIEW) (DOWNLOAD)**
	**2. SLIDE 2 EXPLAIN Figure 8-1** dimensions of a typical bolt showing where sizes are measured. The major diameter is called the crest.
	**3. SLIDE 3 EXPLAIN Figure 8-2** Thread pitch gauge used to measure the pitch of the thread. This bolt has 13 threads to the inch. **4. SLIDE 4 READ Figure 8-3** Bolts and screws have many different heads which determine what tool must be used
	**DISCUSSION: DISCUSS DIFFERENCES BETWEEN UNIFIED NATIONAL COARSE (UNC) & UNIFIED NATIONAL FINE (UNF) THREADS. WHERE MIGHT EACH BE FOUND IN USE ON AN AUTOMOBILE? ASK STUDENTS WHICH THEY THINK WOULD HAVE BETTER HOLDING POWER. DISCUSS CHART 8-1 AMERICAN NATIONAL SYSTEM.**

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	**5. SLIDE 5 EXPLAIN** Figure 8-4 Metric system specifies fasteners by diameter, length, and pitch.
	6. SLIDE 6 READ Figure 8-5 Stronger threads are created by cold-rolling a heat treated bolt blank instead of cutting the threads using a die.
	**EXPLAIN TECH TIP: 1/2 Inch Wrench Does Not Fit a 1/2 Inch Bolt: A common mistake is to think that size of a bolt or nut is size of head. Size of bolt or nut (outside diameter of threads) is usually smaller than size of wrench or socket that fits head of the bolt or nut. Examples are given in following table:** **Wrench Size: — Thread Size** **7/16 inch — 1/4 inch** **1/2 inch — 5/16 inch** **9/16 inch — 3/8 inch** **5/8 inch — 7/16 inch** **3/4 inch — 1/2 inch** **10 mm — 6 mm** **12 mm or 13 mm* — 8 mm** **14 mm or 17 mm* — 10 mm** **NOTE: An open-end wrench can be used to gauge bolt sizes. 3/8 inch wrench will fit threads of 3/8 inch bolt.**
	**7. SLIDE 7 READ Figure 8-6** Metric bolt (cap screw) grade markings and approximate tensile strength.
	**DEMONSTRATION: SHOW EXAMPLES OF A VARIETY OF GENERAL BOLTS & SCREWS. DISCUSS WHAT TYPE OF TOOL MUST BE USED WITH EACH. STUDENTS GUESS WHY EXAMPLES ARE, OR ARE NOT USED ON CARS.**

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	8. **SLIDE 8 EXPLAIN Figure 8-7** types of lock nuts. On the left, a nylon ring; in the center, a distorted shape; and on the right, a castle for use with a cotter key.
	9. **SLIDE 9 READ Figure 8-8** typical bottoming tap used to create threads in holes that are not open, but stop in a casting, such as an engine block. 10. **SLIDE 10 READ Figure 8-9** Many taps, especially larger ones, have the tap drill size printed on the top**.** 11. **SLIDE 11 READ Figure 8-10** die is used to cut threads on a metal rod. 12. **SLIDE 12 EXPLAIN Figure 8-**11 (a) T-handle is used to hold and rotate small taps. **EXPLAIN** Figure 8-11 (b) tap wrench is used to hold and drive larger taps**.** 13. **SLIDE 13 EXPLAIN Figure 8-12** die handle used to rotate a die while cutting threads on a metal rod.
	**DEMONSTRATION: SHOW STUDENTS A TAP AND DIE SET, AND DEMONSTRATE HOW IT IS USED. SHOW STUDENTS BOTH TAPERED AND BOTTOMING TAPS.** **HANDS-ON TASK: HAVE STUDENTS USE A TAP AND DIE SET TO PRACTICE BOTH CUTTING THREADS IN A HOLE WITH A TAP AND THREADING A ROD WITH A DIE.**
	14. **SLIDE 14 EXPLAIN Figure 8-13** typical metric thread pitch gauge.

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	**DISCUSS FREQUENTLY ASKED QUESTION: What is the difference between a tap and thread chaser? A tap is a cutting tool and is designed to cut new threads. A thread chaser has more rounded threads and is designed To clean dirty threads without removing metal. So, when cleaning threads, it is best to use a thread Chaser rather than a tap to prevent the possibility of removing metal, which would affect the fit of the bolt being installed. • SEE FIGURE 8–14.**
	**15. SLIDE 15 EXPLAIN Figure 8-14** thread chaser is shown at top compared to a tap on bottom. A thread chaser is used to clean threads without removing metal.
	**DEMONSTRATION: SHOW & DEMONSTRATE BOTH AN ENGLISH & METRIC THREAD PITCH GAUGE**
	**There are many blades to check on a threadpitch gauge. To speed up process, check tap chart and see which thread pitches are available for that diameter bolt. Check those choices first.**
	**16. SLIDE 16 READ Figure 8-15** Sheet metal screws come with many head types.
	17. SLIDE 17 EXPLAIN Figure 8-16 Various types of nuts (top) & washers (bottom) serve different purposes & used to secure bolts or cap screws.
	**18. SLIDE 18 EXPLAIN Figure 8-17** Some different types of snap rings. An internal snap ring fits inside of a housing or bore, into a groove. An external snap ring fits into a groove on the outside of a shaft or axle. An E-clip fits into a groove in outside of a shaft. A C-clip shown is used to retain a window regulator handle on its shaft.

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	**19. SLIDE 19 EXPLAIN Figure 8-18** typical door panel retaining clip. **20. SLIDE 20 EXPLAIN FIGURE 8-19** Plastic or metal trim tools are available to help the technician remove interior door panels and other trim without causing harm ~~**21. SLIDE 21 Figure 8-20** Pins come in various types.~~ **22. SLIDE 78 EXPLAIN Figure 8-21** Various types of rivets. **23. SLIDE 23 EXPLAIN Figure 8-22** All of the nuts shown are used by themselves except for the pal nut, which is used to lock another nut to a threaded fastener so they will not be loosened by vibration**.** **24. SLIDE 24 EXPLAIN Figure 8-23** A castellated nut is locked in place with a cotter pin.
	**25. SLIDE 25 EXPLAIN Figure 8-24** Helical inserts look like small, coiled springs. The outside is a thread to hold the coil in the hole, and the inside is threaded to fit the desired fastener. **26. SLIDE 26 EXPLAIN Figure 8-25** insert provides new, stock-size threads inside an oversize hole so that the original fastener can be used. **27. SLIDE 27 EXPLAIN Figure 8-26** Heli-Coil® kits, available in a wide variety of sizes, contain everything needed to repair damaged hole back to original size.

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	**28. SLIDE 28 EXPLAIN Figure 8-27** This solid-bushing insert is threaded on the outside, to grip the work piece. The inner threads match the desired bolt size**.** **29. SLIDE 29 EXPLAIN Figure 8-28** Timesert® kit includes the drill (a), the recess cutter (b), a special tap (c), the installer (d), and the Timesert® threaded bushing (e). **30. SLIDE 30 EXPLAIN Figure 8-29** Drill out damaged threads with correct bit. **31. SLIDE 31 EXPLAIN Figure 8-30** Use special tap for insert. **32. SLIDE 32 EXPLAIN Figure 8-31** Put some thread-locking compound on the insert. **33. SLIDE 33 EXPLAIN Figure 8-32** Use driver to drive the keys down flush with the surface of the work piece. **34. SLIDE 34 EXPLAIN Figure 8-33** insert and insert locks should be below the surface of the work piece.
 	**ASEEDUCATION TASK THREAD REPAIR TASK SHEET ON THREAD REPAIR**
	**HOMEWORK: RESEARCH MANUFACTURING PROCESSES USED TO STRENGTHEN METAL IN GENERAL & BOLTS IN PARTICULAR. ASK THEM TO DESCRIBE HOW YOU CAN CHANGE STRENGTH OF A BOLT BY HEATING IT.**