Automotive Engines
Chapter 15 ENGINE OIL
Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This engine systems 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 second SLIDE. 1. Prepare for ASE Engine Repair (A1) certification test content area "D" (Lubrication and Cooling Systems Diagnosis and Repair). 2. Describe the importance and the role of engine oil. 3. Describe the various oil specifications. 4. Discuss the importance of the vehicle manufacturer's requirements. 5. Discuss how to change oil.
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	CH15 Engine Oil
	**1. SLIDE 1 CH22 ENGINE OIL**
	**2. SLIDES 2-3 EXPLAIN** Objectives & KEY TERMS
	**4. SLIDE 4 EXPLAIN INTRODUCTION**
	**Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/**
	**WEB SITE REGULARLY UPDATED**
	**VIDEOS**
	Engine Operation (17 Links)
	5. SLIDE 5 EXPLAIN Properties of Engine Oil
	6. SLIDES 6-7 EXPLAIN SAE Rating
	8. SLIDE 8 EXPLAIN FIGURE 15-1 SAE viscosity rating required is often printed on the engine oil filler cap.
	DEMONSTRATION: Put quart of 10W-30 & a quart of 30W oil in freezer to demonstrate flow characteristics of multigrade vs. single-grade oil in freezing temperatures.
	DISCUSSION: Discuss why OEMs do not recommend single-viscosity oil. Ask students why it was OK for single-viscosity oil to be used in older engines & engines designed for high performance
	Internal Combustion Engine (ICE) lubrication system absorbs 1/3 of heat produced by engine.
	9. SLIDE 9 EXPLAIN API Rating
	10. SLIDE 10 EXPLAIN Figure 15-2 API doughnut for a SAE 5W-30, SN engine oil. When compared to a reference oil, the "energy conserving" designation indicates a 1.1% better fuel economy for SAE 10W-30 oils and 0.5% better fuel economy for SAE 5W-30 oils.
	11. SLIDES 11 EXPLAIN API Rating
	**12. SLIDE 12 EXPLAIN TECH TIP**
	13. SLIDE 13 EXPLAIN ILSAC Oil Rating & **EXPLAIN Figure 15-3** International Lubricant Standardization and Approval Committee (ILSAC) starburst symbol. If this symbol is on the front of the container of oil, then it is acceptable for use in almost any gasoline engine.

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	14. **SLIDE 14** EXPLAIN ILSAC Oil Rating **DISCUSSION: Ask students to discuss differences between SAE & API ratings. Then have them identify those ratings on different brands and viscosities of oils. Then ask them to compare API, ILSAC, & European oil ratings standards.**
	**Tell the students that oil ratings are constantly updated and newer oil is backward compatible, meaning it can be used in older vehicles.**
	15. **SLIDE 15** EXPLAIN European Oil Rating System & EXPLAIN **Figure 15-4** ACEA ratings are included on the back of the oil container if it meets any of the standards. ACEA ratings apply to European vehicles only such as BMW, Mercedes, Audi, and VW
	16. **SLIDE 16** EXPLAIN Japanese Oil Ratings
	**DISCUSSION: Have the students discuss why Japanese standards for valve train wear are more stringent**
	**Let students know that vehicles driven in Japan are required to be repowered or replaced at given intervals**
	17. **SLIDE 17** EXPLAIN Engine Oil Additives 18. **SLIDE 18** EXPLAIN **Figure 15-5** Viscosity index (VI) improver is a polymer and feels like finely ground foam rubber. When dissolved in the oil, it expands when hot to keep the oil from thinning
	**DEMONSTRATION: Using saved oil show students the difference between new oil and oil that is dirty. Have students use latex gloves to feel difference between new & contaminated oil**
	**DISCUSSION: Have students discuss reason why oil additives are important. Ask them whether all OEMS use same additives**

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	**19. SLIDE 19 EXPLAIN Oil Brand Compatibility**
	**20. SLIDE 20 EXPLAIN TECH TIP**
	**21. SLIDE 21 EXPLAIN FREQUENTLY ASKED QUESTION** **22. SLIDE 22 EXPLAIN FREQUENTLY ASKED QUESTION**
	**23. SLIDE 23 EXPLAIN Figure 22-6** Using a zinc additive is important when using SM or SN-rated oil in an engine equipped with a flat-bottom lifter, especially during the break-in period
	**24. SLIDES 24-25 EXPLAIN** Synthetic Oil **26. SLIDE 26 EXPLAIN Figure 15-7** Mobil 1 synthetic engine oil is used by several vehicle manufacturers in new engines. **27. SLIDE 27 EXPLAIN** Synthetic Oil & **EXPLAIN Figure 15-8** Both oils have been cooled to -20° F (-29° C). Notice that the synthetic oil on the left flows more freely than the mineral oil on the right even though both are SAE 5W-30
	**28. SLIDE 28 EXPLAIN TECH TIP**
	**Synthetic oils 1st developed for Army Air Forces (WWII) to keep their high-perf. turbo radial aircraft engines alive, which could not be done with conventional oils.**
	**DISCUSSION: Ask students to compare advantages & disadvantages of synthetic and conventional oils included in service intervals**
	**29. SLIDE 29 EXPLAIN Vehicle-Specific Specifications** **30. SLIDE 30 EXPLAIN Figure 15-9** European vehicle manufacturers usually specify engine oil with a broad viscosity range, such as SAE 5W-40, and their own unique standards, such as the Mercedes specification 229.51. Always use oil specified by OEM

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	31. **SLIDES 31-32** EXPLAIN HIGH MILEAGE OILS
	**DISCUSSION:** **Ask the students to discuss any advantages & disadvantages that high mileage oils have compared to conventional and synthetic oils**
	**HANDS-ON TASK:** **Have students use owner's manual or electronic service information to look up and find OEM specific oil specifications for at least 2 different lab vehicles**
	33. **SLIDE 33** EXPLAIN **Oil Filters &** EXPLAIN **Figure 15-10** A rubber diaphragm acts as an antidrainback valve to keep the oil in the filter when the engine is stopped and the oil pressure drops to zero.
	34. **SLIDE 34** EXPLAIN **Figure 15-11** cutaway of a typical spin-on oil filter. Engine oil enters the filter through the small holes around the center of the filter and flows through the pleated paper filtering media and out the large hole in the center of the filter. The center metal cylinder with holes is designed to keep the paper filter from collapsing under the pressure. The bypass valve can be built into the center on the oil filter or is part of the oil filter housing and located in the engine.
	35. **SLIDE 35** EXPLAIN **Figure 15-12** typical filter crusher. The hydraulic ram forces out most of the oil from the filter. The oil is trapped underneath the crusher and is recycled.
	36. **SLIDE 36** EXPLAIN FREQUENTLY ASKED QUESTION
	37. **SLIDE 37** EXPLAIN FREQUENTLY ASKED QUESTION
	38. **SLIDE 38** EXPLAIN TECH TIP
	**DEMONSTRATION:** **Taking a name brand filter and a cheap oil filter that have been cut open, show the students difference between the two**

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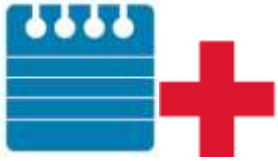
	**DISCUSSION: Ask students to discuss difference between name brand filter and cheaper filter and what it could mean to them as consumers**
	**39. SLIDE 39 EXPLAIN** Oil Change & **EXPLAIN Figure 15-13** Many vehicle manufacturers can display the percentage of oil life remaining, whereas others simply turn on a warning lamp when it has been determined that an oil change is required.
	**40. SLIDE 40 EXPLAIN TECH TIP**
	**41. SLIDE 41 EXPLAIN Figure 22-14 (a)** A pick is pushed through the top of an oil filter that is positioned vertically. **(b)** When the pick is removed, a small hole allows air to get into the top of the filter which then allows the oil to drain out of the filter and back into the engine.
	**42. SLIDE 42 EXPLAIN TECH TIP**
	**DISCUSSION: Ask students to find out if their vehicles have a service monitor and at what intervals that light comes on. Have them write down procedure to reset light**
	**ON-VEHICLE NATEF TASK Perform oil and filter change PAGE 42**
	**SAFETY: Make sure students are aware that hot oil causes burns and is carcinogenic, and use of latex gloves is highly recommended**
	**SEARCH INTERNET: Have students use Internet to research difference between high mileage & synthetic oils & what makes high mileage oil different from regular motor oil. Ask them to answer question "Are high mileage oils worth the extra cost?" & "Do high mileage oils really work?" and report their findings at the beginning of the next class in a discussion**

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	**Talk through SUMMARY and questions** **HOMEWORK: complete Ch15 crossword puzzle:** **http://www.jameshalderman.com/links/book_engine_theory_serv_7/cw/crossword_ch_15.pdf**
	**42. SLIDE 42 EXPLAIN TECH TIP** **83. SLIDE 83 EXPLAIN FREQUENTLY ASKED QUESTION**