









Manual Drive Train and Axles 1st Edition

Chapter 3 Introduction to Drive Trains

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of Manual Drive Trains and Axles . 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. <ol style="list-style-type: none">1. Define torque, and explain the relationship between torque and horsepower.2. Describe the various gear types and their effect on speed, torque, and direction of rotation.3. Explain gear ratios and their effect on vehicle operation.4. Discuss the types of manual transmissions and transaxles that are currently in use.5. Discuss automatic transmissions and the planetary gear sets used for automatic transmissions.6. Compare rear-wheel drive, front-wheel drive, four-wheel drive, and all-wheel drive.7. Explain the characteristics of driveshafts and drive axle assemblies.
Establish the Mood or Climate	Provide a <i>WELCOME</i> , 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	Ch03 INTRODUCTION TO DRIVE TRAINS
   	<p>1. SLIDE 1 INTRODUCTION TO DRIVE TRAINS</p> <p>2. SLIDES 2-4 EXPLAIN OBJECTIVES</p> <p>Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/ WEB SITE IS CONSTANTLY UPDATED</p> <p>5. SLIDE 5 EXPLAIN TORQUE</p> <p>6. SLIDE 6 EXPLAIN Gear Types</p> <p><u>DEMONSTRATION:</u> SHOW HOW A FULCRUM AND LEVER CAN REDUCE LIFTING EFFORT. SET A LONG LEVER ON FULCRUM 1/4 OF WAY TO THE LOAD YOU WANT TO LIFT. MOVE FULCRUM TO 1/4 OF DISTANCE FROM THE INPUT POINT. SHOW STUDENTS HOW DECREASED LIFT EFFORT INCREASES THE LENGTH OF MOVEMENT AND THEN OPPOSITE HAPPENS FOR OTHER SETUP.</p>
 	<p><u>DISCUSSION:</u> DISCUSS OTHER PLACES ON THE VEHICLE WHERE LEVERAGE IS USED TO REDUCE INPUT EFFORT</p> <p><u>HANDS-ON TASK:</u> USE SEVERAL COMBINATIONS OF FULCRUMS AND LEVERS TO LIFT OBJECTS SO THEY CAN EXPERIENCE INPUT FORCE REQUIRED TO LIFT HEAVIER OBJECTS OR TO MOVE OBJECTS LONGER DISTANCE.</p>
 	<p>7. SLIDE 7 EXPLAIN FIGURE 3-9 The teeth of a spur gear are cut parallel to the shaft, and this produces a straight pressure between the driving and driven gear teeth.</p> <p>8. SLIDE 8 EXPLAIN FIGURE 3-10 teeth of a helical gear are cut on a slant, and this produces an axial or side thrust.</p> <p><u>DEMONSTRATION:</u> SHOW SPUR GEAR & EXAMPLES OF WHERE THEY WOULD FIND SPUR GEARS IN NON-AUTOMOTIVE APPLICATIONS. (EXAMPLES: BOAT WINCHES, GEAR REDUCTION UNITS ON MACHINERY, AND ANALOG CLOCKS AND WATCHES)</p>

ICONS



Ch03 INTRODUCTION TO DRIVE TRAINS

INTERNAL & EXTERNAL GEAR

EXTERNAL GEARS, 2:1

EXTERNAL GEARS WITH IDLER

DISCUSSION: DISCUSS DIFFERENCE BETWEEN SPUR AND HELICAL GEARS AND OTHER PLACES IN VEHICLE WHERE YOU MAY FIND EACH.

GOOD EXAMPLE OF AN IDLER GEAR USED IN IN-BLOCK CAM SYSTEM IS A GEAR CALLED A "BONE," WHICH TAKES PLACE OF A TIMING CHAIN

9. SLIDE 9 EXPLAIN FIGURE 3-11 Bevel gears are commonly used in differentials.

10. SLIDE 10 EXPLAIN FIGURE 3-12 A hypoid gear set uses a pinion gear that is located below the centerline of the ring gear and is commonly used in drive axles.

DEMONSTRATION: SHOW EXAMPLE OF A HYPOID GEAR IN DIFFERENTIAL. POINT OUT HOW THE PINION GEAR IS OFFSET FROM RING GEAR

11. SLIDE 11 EXPLAIN Gear Ratios

12. SLIDE 12 EXPLAIN FIGURE 3-14 gear ratio is determined by dividing the number of teeth on the driven (output) gear by number of teeth on driving (input) gear.

DEMONSTRATION: HOW USING DIFFERENT SIZE COMBINATIONS OF GEARS CHANGES ROTATION SPEED

DISCUSSION: DISCUSS HOW GEAR RATIOS HELP WHEN PEDALING MULTI-SPEED BIKE

ANIMATION: IDLER GEAR OPERATION










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[HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYAUTOMOTIVELAB_2/ANIMATIONS/A8_ANIMATION/CHAPTER95 FIG_95_10/INDEX.HTM](http://media.pearsoncmg.com/ph/chet/chet_myautomotivelab_2/animations/a8_animation/chapter95_fig_95_10/index.htm)

13. SLIDE 13 EXPLAIN Manual Transmission and Transaxles

14. SLIDE 14 EXPLAIN FIGURE 3-16 A manual transmission provides several gear ratios and a method to shift them.

15. SLIDE 15 EXPLAIN FIGURE 3-24 Transverse (a) and longitudinal (b) mounted front-wheel-drive (FWD)

ICONS	Ch03 INTRODUCTION TO DRIVE TRAINS
	<p>drivetrains.</p> <p>16. SLIDE 16 EXPLAIN Automatic Transmissions</p> <p>17. SLIDE 17 EXPLAIN FIGURE 3–21 A typical planetary gear set showing the terms that are used to describe each member.</p>
	<p>18. SLIDES 18-19 EXPLAIN Rear-wheel Drive, Front-wheel Drive, Four-wheel Drive, and All-wheel Drive</p> <p>20. SLIDE 20 EXPLAIN FIGURE 3–23 RWD drivetrain uses a transmission to provide the necessary gear ratio and a single driveshaft to transfer power to the rear axle (a). A FWD drivetrain uses a transaxle that combines the transmissions final drive, and differential (b). A driveshaft is used for each front drive wheel.</p>
	<p>DEMONSTRATION: SHOW VEHICLE WITH A TRANSMISSION AND ONE WITH A TRANSAXLE.</p>
	
	<p>DISCUSSION: DISCUSS ADVANTAGES & DISADVANTAGES OF THE TRANSAXLE DESIGN COMPARED TO TRANSMISSION DESIGN</p>
	<p>DISCUSSION: DISCUSS "REDUCTION" & "OVERDRIVE." IN EACH COMBINATION, SOMETHING IS GAINED & SOMETHING IS LOST (REDUCTION, # OF ROTATIONS IS LOST BUT TORQUE IS INCREASED</p>
	<p>21. SLIDES 21-22 EXPLAIN Driveshafts and Drive Axle Assemblies</p> <p>23. SLIDE 23 EXPLAIN FIGURE 3–25 (a) A rear-wheel-drive (RWD) driveshaft uses a pair of universal joints to allow the rear axle to move up and down. (b) A front-wheel-drive (FWD) driveshaft uses a pair of constant-velocity joints to allow the front wheels to move up and down and steer.</p>
	<p>NATEF Task: Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.</p>
	<p>24. SLIDES 24-26 EXPLAIN Summary</p>