



Western Technical College

## 32404367 Drive Systems 2

### Course Outcome Summary

#### Course Information

<b>Description</b>	A study of the driveline component parts with an emphasis on diagnosis, maintenance and repair procedures, manual transmissions/transaxles, drive axles systems and four-wheel drive/All wheel drive systems.
<b>Career Cluster</b>	Transportation, Distribution and Logistics
<b>Instructional Level</b>	Technical Diploma Courses
<b>Total Credits</b>	3
<b>Total Hours</b>	108

#### Pre/Corequisites

Prerequisite	32404382 Automotive Climate Control
Prerequisite	32404357 Drive Systems 1
Prerequisite	32404386 Introduction to Hybrid and Alternative Fueled Vehicles

#### Textbooks

*Fundamentals of Automotive Technology*. 2nd Edition. Copyright 2018. CDX Automotive. Publisher: Jones & Bartlett Publishers. **ISBN-13:** 978-1-2842-0995-5. Required.

#### Learner Supplies

Uniform: Three short sleeve, black/red shirts with embroidered name. **Vendor:** Campus Shop. Required.

Safety glasses with side eye protection that meet Z87 OSHA guidelines. **Vendor:** To be discussed in class. Required.

Six inch ankle high, quality leather work shoes - \$75.00-100.00. **Vendor:** To be discussed in class. Required.

Pocket knife, six inch metal pocket ruler (English/metric measurement), small pocket flashlight, and pocket flat head screwdriver - \$20.00. **Vendor:** To be discussed in class. Required.

## Program Outcomes

1. Demonstrate professionalism appropriate for the auto service industry
2. Perform diagnosis, service, and repair of automotive manual drive train and axle systems
3. Perform diagnosis, service, and repair of automotive steering and suspension systems
4. Perform diagnosis, service, and repair of automotive brake systems
5. Perform diagnosis, service, and repair of automotive electrical and electronic systems

## Course Competencies

### 1. Investigate manual drive trains.

#### Assessment Strategies

- 1.1. Written Product
- 1.2. Skill Demonstration

#### Criteria

*You will know you are successful when:*

- 1.1. you identify drive train concerns.
- 1.2. you research vehicle service information.
- 1.3. you check for fluid leaks and condition.
- 1.4. you service drive train fluids.

#### Learning Objectives

- 1.a. Identify and interpret drive train concerns; determine needed action.
- 1.b. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.
- 1.c. Check fluid condition; check for leaks; determine necessary action.
- 1.d. Drain and refill manual transmission/transaxle and final drive unit.

### 2. Diagnose manual transmission/transaxle

#### Assessment Strategies

- 2.1. Written Objective Test
- 2.2. Skill Demonstration

#### Criteria

*You will know you are successful when:*

- 2.1. you review the operational functions of an electronically controlled manual transmission/transaxle.
- 2.2. you describe powerflow principles of manual transmission/transaxles.
- 2.3. you diagnose manual transmission/transaxle concerns.

#### Learning Objectives

- 2.a. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.
- 2.b. Diagnose noise concerns through the application of transmission/transaxle powerflow principles.
- 2.c. Diagnose hard shifting and jumping out of gear concerns; determine needed action.
- 2.d. Diagnose transaxle final drive assembly noise and vibration concerns; determine needed action.

### 3. Repair manual transmission/transaxle

#### Assessment Strategies

- 3.1. Written Product
- 3.2. Skill Demonstration

#### Criteria

*You will know you are successful when:*

- 3.1. you select the correct [TOOLS, EQUIPMENT, INSTRUMENTS, MATERIALS, SUPPLIES]
- 3.2. you inspect, adjust, lubricate, and replace manual transmission controls.
- 3.3. you disassemble and reassemble manual transmission/transaxle.
- 3.4. you inspect and clean internal transmission/transaxle components.

#### Learning Objectives

- 3.a. Inspect, adjust, lubricate, and/or replace shift linkages, brackets, bushings, cables, pivots, and levers.
- 3.b. Disassemble, inspect clean, and reassemble internal transmission/transaxle components.

### 4. Diagnose drive axle concerns.

#### Assessment Strategies

- 4.1. Written Product
- 4.2. Skill Demonstration

#### Criteria

*You will know you are successful when:*

- 4.1. you diagnose drive axle noise and vibration concerns.
- 4.2. you inspect drive axle components.
- 4.3. you perform drive axle checks and measurements.

#### Learning Objectives

- 4.a. Diagnose noise and vibration concerns; determine needed action.
- 4.b. Inspect and replace companion flange and pinion seal; measure companion flange runout.
- 4.c. Inspect ring gear and measure runout; determine needed action.
- 4.d. Check ring and pinion tooth contact patterns; perform needed action.
- 4.e. Diagnose noise, slippage, and chatter concerns; determine needed action.
- 4.f. Measure rotating torque; determine needed action.

### 5. Repair drive axle systems.

#### Assessment Strategies

- 5.1. Written Product
- 5.2. Skill Demonstration

#### Criteria

*You will know you are successful when:*

- 5.1. you select the correct [TOOLS, EQUIPMENT, INSTRUMENTS, MATERIALS, SUPPLIES].
- 5.2. you check for fluid leaks and condition.
- 5.3. you perform differential fluid service.
- 5.4. you measure and adjust all components of the differential.
- 5.5. you disassemble and reassemble differential assembly.

#### Learning Objectives

- 5.a. Clean and inspect differential housing; check for leaks; inspect housing vent.
- 5.b. Check and adjust differential housing fluid level.
- 5.c. Drain and refill differential case; use proper fluid type per manufacturer specification .
- 5.d. Remove, inspect, and reinstall drive pinion and ring gear, spacers, sleeves, and bearings.
- 5.e. Measure and adjust drive pinion depth.
- 5.f. Measure and adjust drive pinion bearing preload.
- 5.g. Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup or shim types).
- 5.h. Disassemble, inspect, measure, and adjust or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case.

5.i. Reassemble and reinstall differential case assembly; measure runout; determine needed action.

## **6. Diagnose four wheel drive/ All wheel drive components**

### **Assessment Strategies**

- 6.1. Written Product
- 6.2. Skill Demonstration

### **Criteria**

*You will know you are successful when:*

- 6.1. you check for fluid leaks and condition.
- 6.2. you inspect, test, adjust, and replace electrical/mechanical components of all-wheel and four wheel drive systems.
- 6.3. you identify concerns related to tire circumference and final drive ratios.

### **Learning Objectives**

- 6.a. Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.
- 6.b. Inspect locking hubs; determine needed action.
- 6.c. Identify concerns related to variations in tire circumference and/or final drive ratios.
- 6.d. Diagnose, test, adjust, and/or replace electrical/electronic components of four-wheel drive/all-wheel drive systems

## **7. Repair four wheel drive/ All wheel drive components**

### **Assessment Strategies**

- 7.1. Written Product
- 7.2. Skill Demonstration

### **Criteria**

*You will know you are successful when:*

- 7.1. you research vehicle service information.
- 7.2. you inspect, adjust, and repair shifting controls.
- 7.3. you disassemble, service, and reassemble transfer case components.
- 7.4. you disassemble, service, and reassemble all-wheel drive components.
- 7.5. you select the correct [TOOLS, EQUIPMENT, INSTRUMENTS, MATERIALS, SUPPLIES].

### **Learning Objectives**

- 7.a. Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.
- 7.b. Disassemble, service, and reassemble transfer case and components.