



Wayne County Community College District

COURSE SYLLABUS

AUT 126 Manual Drive Train & Axles I

CREDIT HOURS: 3.00

CONTACT HOURS: 60.00

COURSE DESCRIPTION:

This course is designed to provide students with the necessary skills and understanding to identify basic characteristics and components of the manual drive train and axle design. On-vehicle inspection, diagnosis, and repair are performed by the student. Identification of special tools used on these systems will also be explained. In addition, ASE principles for certification will be introduced to the student.

PREREQUISITIES: AUT 114, AUT 115, AUT 116, AUT 117

EXPECTED COMPETENCIES:

Upon successful completion of this course, the student will be able to:

Industry Information

- **Identify various career types in the automotive field**
Objective
 - Identify the eight Automotive Service Excellence (ASE) service areas for technicians and the components included in each.
 - Identify career opportunities directly related to the automotive technology field.
 - Identify various methods used to pay automotive technicians.
 - Identify the difference between a union and a non-union shop.

Shop Safety

For every task in Manual Drive Train & Axles, the following safety requirements must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

- **Identify protective clothing and equipment and their proper use; proper shop behavior; principles of fire safety; and federal regulations concerning hazardous material and shop safety.**
Objective
 - Describe how to select individual personal protective clothing and equipment.
 - Identify the dangers of improper behavior in the shop.
 - Identify the importance of proper grooming and hygiene.
 - Identify the classes of fires and the types of fire extinguishers.
 - Identify the use of a fire blanket.
 - Identify general fire emergency procedures.
 - Identify the Occupational Safety and Health Administration (OSHA) regulations.
 - Identify the Environmental Protection Agency (EPA) regulations.
 - Identify the safe use of fire protection equipment
 - Identify the safe use of shop equipment following Environmental Protection Agency (EPA) and Occupational Safety and Health Act (OSHA) regulations



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- **Identify and explain the safe and proper use of chemicals**

Objective

- Identify the types and uses of solvents.
- Identify the types and uses of soaps and cleaning solutions.
- Identify the types and uses of oils.
- Identify the types and uses of greases.
- Identify the types and uses of specialty additives.
- Identify the types and uses of specialty chemicals.
- Describe the five general rules for using automotive chemicals.
- Complete the assignment sheet on lubricants.
- Complete the assignment sheet on lubricants.
- Identify gasses and the hazards they present.
- Identify the hazards of asbestos dust.

- **Identify and explain the safe and proper use of basic hand tools**

Objective

- Identify the types and uses of common end wrenches.
- Identify the types and uses of socket set components.
- Identify the types and uses of wrenches.
- Identify the types and uses of screwdrivers.
- Identify the types and uses of pliers.
- Identify the types and uses of hammers.
- Identify the types and uses of punches and chisels.

- **Identify and explain the safe and proper use of specialty tools, fasteners, and measuring tools**

- Identify the types and uses of specialty tools.
- Describe the procedures for cutting threads onto a rod or into a hole, repairing damaged threads, and removing broken bolts.
- Identify common nuts and bolts in the English system.
- Identify common nuts and bolts in the metric system.
- Identify other types of common fasteners.
- Identify the types and uses of measuring tools.
- Identify the procedures for the care and use of measuring tools.

- **Identify and explain the safe and proper use of power tools and shop equipment**

- Identify the types and uses of pneumatic, hydraulic, and electric power tools.
- Identify the hazards of power tools.
- Identify the types, purposes, and safety considerations of common shop equipment.
- Demonstrate the ability to:
 - A. Lift a vehicle

General Drive Train Diagnosis

- **Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. P-1**

Objective

- Identify the procedures for identifying the customer's concern.
- Identify terms and definitions associated with basic principles of automotive transmissions.
- Identify the basic principles by which an automotive transmission system functions.



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- Identify terms and definitions associated with basic principles of automotive transmissions.
- Identify the basic principles by which an automotive drive train functions.
- **Identify and interpret drive train concern; determine necessary action P-1**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Ask the customer to describe the manual drive train concern. Record concern in the following space.
 - Ask the customer the following series of questions. Record the answers in the space provided.
 - a. When did the concern first occur?
 - b. Is the concern continuous or intermittent?
 - c. Is the transmission making noise? In what gear?
 - d. Is the clutch releasing, engaging, or slipping?
 - e. Is there gear clash?
 - f. Is there a clunk during acceleration or deceleration?
 - g. Is there fluid leakage?
 - h. Are there any unusual vibrations?
 - i. What is the recent service history of the vehicle?
 - Based on the answers to the questions, determine the next step in the diagnostic process for this vehicle. Record in the following space.
- **Research applicable vehicle and service information, such as drive train system operation, fluid type, vehicle service history, service precautions, and technical service bulletins P-1**
Objective
 - Identify terms and definitions associated with basic principles of automotive drive trains.
 - Identify the basic principles by which an automotive drive train functions.
- **Locate and interpret vehicle and major component identification numbers. P-1**
Objective
 - Identify terms and definitions associated with basic principles of automotive drive train systems.
 - Identify the basic principles by which an automotive drive train system functions.
- **Diagnose fluid loss, level, and condition concerns; determine necessary action P-1**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals. Record the necessary information in the following space.
 - Use proper lifting equipment to raise the vehicle. CAUTION: When lifting a vehicle, always use proper lifting equipment and observe all safety precautions.
 - Diagnose manual drive train fluid related concerns.
 - a. Check fluid usage or leakage.
 - b. Check fluid condition.
 - c. Check fluid level.



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- Identify correct replacement for component being serviced. Record in the following space.
- Using service information, locate a procedure for draining and refilling manual drive train component fluids. Include procedures for the manual transmission, differential assembly, manual transaxle, and transaxle final drive. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the box to approve the procedure.
- Using the procedure, drain and refill the manual drive train component fluids.
- **Drain and fill manual transmission/transaxle and final drive unit P-1**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals. Record the necessary information in the following space.
 - Use proper lifting equipment to raise the vehicle.
 - Diagnose manual drive train fluid related concerns.
 - a. Check fluid usage or leakage.
 - b. Check fluid condition.
 - c. Check fluid level.
 - Identify correct replacement for component being serviced.
 - Using service information, locate a procedure for draining and refilling manual drive train component fluids. Include procedures for the manual transmission, differential assembly, manual transaxle, and transaxle final drive. Make sure the procedure is appropriate for the make and model of the vehicle.

Clutch Diagnosis and Repair

- **Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine necessary action P-1**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals.
 - Determine if the clutch linkage is properly adjusted
 - Perform a road test to determine if clutch is operating properly.
 - Determine the necessary action to correct any problems found
- **Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform necessary action P-1**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals.
 - Inspect the clutch pedal assembly and linkage
 - Determine necessary action to correct any problems noted. Include further diagnosis and repairs



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- **Inspect hydraulic clutch slave and master cylinders, lines, and hoses; determine necessary action P-1**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals.
 - Inspect the clutch pedal assembly and linkage
 - Determine necessary action to correct any problems noted. Include further diagnosis and repairs

 - **Inspect and replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing and linkage, and pilot bearing/bushing (as applicable). P-1**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals.
 - Prepare the clutch for service
 - Remove manual transmission or transaxle
 - Remove clutch assembly
 - Clean and inspect clutch components
 - Clean and inspect the flywheel
 - Inspect the engine block, bell housing, transmission/transaxle case mating surfaces and alignment dowels.
 - Replace clutch assembly
 - Check operation of clutch assembly

 - **Bleed clutch hydraulic system P-1**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals.
 - Use proper lifting equipment to raise vehicle to access the bleeder valve.
 - Fill the hydraulic clutch reservoir with brake fluid
 - Attach rubber hose to bleeder valve. Place other end of hose into a clear container
 - Pump the clutch pedal several times
 - Open the bleeder valve and allow the fluid to flow into the clear container
 - Release the clutch pedal
 - Repeat process until all air has been removed
 - Top off the reservoir and performance test the clutch to be sure it is operating properly.

 - **Inspect flywheel and ring gear for wear and cracks, determine necessary action P-1**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals.
 - Prepare the clutch for service
 - Remove manual transmission or transaxle
 - Remove clutch assembly
 - Clean and inspect clutch components
 - Clean and inspect the flywheel



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- Inspect the engine block, bell housing, transmission/transaxle case mating surfaces and alignment dowels.
- Replace clutch assembly
- Check operation of clutch assembly

- **Inspect engine block, core plugs, rear main engine oil seal clutch (bell) housing, transmission/transaxle case mating surfaces, and alignment dowels; determine necessary action P-1**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals.
 - Prepare the clutch for service
 - Remove manual transmission or transaxle
 - Remove clutch assembly
 - Clean and inspect clutch components
 - Clean and inspect the flywheel
 - Inspect the engine block, bell housing, transmission/transaxle case mating surfaces and alignment dowels.
 - Replace clutch assembly
 - Check operation of clutch assembly

- **Measure flywheel run out and crankshaft end play; determine necessary action P-2**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals.
 - Prepare the clutch for service
 - Remove manual transmission or transaxle
 - Remove clutch assembly
 - Clean and inspect clutch components
 - Clean and inspect the flywheel
 - Inspect the engine block, bell housing, transmission/transaxle case mating surfaces and alignment dowels.
 - Replace clutch assembly
 - Check operation of clutch assembly

Transmission/Transaxle Diagnosis and Repair

- **Remove and reinstall transmission/transaxle P-1**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals. Record the necessary information in the following space.
 - Using service information, locate a procedure for removing the manual transmission from the vehicle. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced. Have the instructor check the box to approve the procedure.
 - Prepare the vehicle for transaxle removal



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- Using service information, locate a procedure for removing the manual transaxle. Make sure the procedure is appropriate for the make and model of the vehicle

- **Disassemble, clean, and reassemble transmission/transaxle components P-1**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals. Record the necessary information in the following space.
 - Inspect the transmission for leakage.
 - Drain the transmission fluid from the manual transmission.
 - Using service information, locate a procedure for disassembling the manual transmission. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using the procedure, disassemble the transmission.
 - Clean the manual transmission components and case with solvent and blow-dry them with compressed air.
 - Using service information, locate a procedure for inspecting the manual transmission components. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Use proper lifting equipment to raise the vehicle
 - Inspect transaxle for leakage
 - Using service information, locate a procedure for disassembling the manual transaxle. Determine and record critical dimensions or clearance of manual transaxle components. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for cleaning the manual transaxle. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced
 - Using service information, locate a procedure for inspecting the manual transaxle. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced

- **Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents; perform necessary action. P-2**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals. Record the necessary information in the following space.
 - Inspect the transmission for leakage.
 - Drain the transmission fluid from the manual transmission.
 - Using service information, locate a procedure for disassembling the manual transmission. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using the procedure, disassemble the transmission.
 - Clean the manual transmission components and case with solvent and blow-dry them with compressed air.
 - Using service information, locate a procedure for inspecting the manual transmission components. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Use proper lifting equipment to raise the vehicle



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- Inspect transaxle for leakage
- Using service information, locate a procedure for disassembling the manual transaxle. Determine and record critical dimensions or clearance of manual transaxle components. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
- Using service information, locate a procedure for cleaning the manual transaxle. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced
- Using service information, locate a procedure for inspecting the manual transaxle. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced

- **Diagnose noise concerns using transmission/transaxle powerflow principles. P-2**
Objective

- **Diagnose hard shifting, jumping out of gear concerns; determine necessary action P-2**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals. Record the necessary information in the following space.
 - Determine if the manual transmission's linkage is properly adjusted.
 - Perform a road test.
 - Use proper lifting equipment to raise the vehicle
 - Inspect transaxle for leakage
 - Using service information, locate a procedure for disassembling the manual transaxle. Determine and record critical dimensions or clearance of manual transaxle components. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for cleaning the manual transaxle. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced
 - Using service information, locate a procedure for inspecting the manual transaxle. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced

- **Inspect, adjust, and reinstall shift linkages, brackets, bushings, cables, pivots, and levers P-2**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals. Record the necessary information in the following space.
 - Use proper lifting equipment to raise the vehicle
 - Using service information, locate a procedure for reinstall the manual transmission, make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Test the adjustment of the shift linkage and operation of the manual transmission.
 - Using service information, locate a procedure for reinstalling the manual transaxle. Include the appropriate torque specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Test the adjustment of the shift linkage and the operation of the manual transaxle.



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- **Inspect, replace, and align power train mounts P-2**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals. Record the necessary information in the following space.
 - Use proper lifting equipment to raise the vehicle
 - Using service information, locate a procedure for reinstall the manual transmission, make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Test the adjustment of the shift linkage and operation of the manual transmission
 - Using service information, locate a procedure for reinstalling the manual transaxle. Include the appropriate torque specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Test the adjustment of the shift linkage and the operation of the manual transaxle.

 - **Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces P-2**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals. Record the necessary information in the following space.
 - Remove all gasket material from the case, extension housing, side plate, and input shaft bearing retaining collar.
 - Using service information, locate a procedure for measure each critical clearance. Make sure the procedure is appropriate for the make and model of the vehicle.
 - Inspect the oil pump components and oil slingers.
 - Using service information, locate a procedure for reassembling the manual transmission. Make sure the appropriate for the make and model of the vehicle to be serviced.
 - Bench test the transmission to ensure all parts turn freely and shift smoothly in all gears.
 - Using service information, locate a procedure for reassembling the manual transaxle. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for measuring and correct the critical clearances for manual transaxle components. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for inspecting, repairing, and replacing manual transaxle components. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.

 - **Remove and replace transaxle final drive. P-3**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals.
 - Using service information, locate a procedure for removing the manual transmission. Include the appropriate torque specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for repairing or replacing the manual transmission. Include the appropriate torque specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.



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- Using service information, locate a procedure for reinstalling the manual transmission. Include the appropriate torque specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.

- **Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs P-2**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals. Record the necessary information in the following space. Remove all gasket material from the case, extension housing, side plate, and input shaft bearing retaining collar.
 - Using service information, locate a procedure for measure each critical clearance. Make sure the procedure is appropriate for the make and model of the vehicle.
 - Inspect the oil pump components and oil slingers.
 - Using service information, locate a procedure for reassembling the manual transmission. Make sure the appropriate for the make and model of the vehicle to be serviced.
 - Bench test the transmission to ensure all parts turn freely and shift smoothly in all gears.
 - Using service information, locate a procedure for reassembling the manual transmission. Make sure the appropriate for the make and model of the vehicle to be serviced.
 - Bench test the transmission to ensure all parts turn freely and shift smoothly in all gears.
 - Using service information, locate a procedure for reassembling the manual transaxle. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for measuring and correct the critical clearances for manual transaxle components. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for inspecting, repairing, and replacing manual transaxle components. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.

- **Measure end play or preload (shim or spacer selection procedure) on transmission/transaxle shafts; perform necessary actions. P-1**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals. Record the necessary information in the following space. Remove all gasket material from the case, extension housing, side plate, and input shaft bearing retaining collar.
 - Using service information, locate a procedure for measure each critical clearance. Make sure the procedure is appropriate for the make and model of the vehicle.
 - Inspect the oil pump components and oil slingers.
 - Using service information, locate a procedure for reassembling the manual transmission. Make sure the appropriate for the make and model of the vehicle to be serviced.
 - Bench test the transmission to ensure all parts turn freely and shift smoothly in all gears.
 - Using service information, locate a procedure for reassembling the manual transmission. Make sure the appropriate for the make and model of the vehicle to be serviced.
 - Bench test the transmission to ensure all parts turn freely and shift smoothly in all gears.



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- Using service information, locate a procedure for reassembling the manual transaxle. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
- Using service information, locate a procedure for measuring and correct the critical clearances for manual transaxle components. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
- Using service information, locate a procedure for inspecting, repairing, and replacing manual transaxle components. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.

- **Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings P-1**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals. Record the necessary information in the following space. Remove all gasket material from the case, extension housing, side plate, and input shaft bearing retaining collar.
 - Using service information, locate a procedure for measure each critical clearance. Make sure the procedure is appropriate for the make and model of the vehicle.
 - Inspect the oil pump components and oil slingers.
 - Using service information, locate a procedure for reassembling the manual transmission. Make sure the appropriate for the make and model of the vehicle to be serviced.
 - Bench test the transmission to ensure all parts turn freely and shift smoothly in all gears.
 - Using service information, locate a procedure for reassembling the manual transmission. Make sure the appropriate for the make and model of the vehicle to be serviced.
 - Bench test the transmission to ensure all parts turn freely and shift smoothly in all gears.
 - Using service information, locate a procedure for reassembling the manual transaxle. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for measuring and correct the critical clearances for manual transaxle components. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for inspecting, repairing, and replacing manual transaxle components. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.

- **Diagnose transaxle final drive assembly noise and vibration concerns; determine necessary action P-3**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals.
 - Road test the vehicle.
 - Use proper lifting equipment to raise the vehicle
 - Inspect the transaxle differential for leaks
 - Rotate the axle shafts back and forth while observing movement.
 - Inspect all four of the rubber boots that cover the CV-joint.
 - Grasp each of the CV joints on the shaft trying to wiggle the shaft.
 - Connect the exhaust ventilation equipment.



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- Start the engine. Put the vehicle in gear. Use stethoscope to listen to the transaxle final drive component and wheel bearing to determine the source of noises.
- Turn off the engine and disconnect the exhaust ventilation equipment
- Determine actual source of the problem.

- **Remove, inspect, measure, adjust, and reinstall transaxle final drive pinion gears (spiders), shafts, side gears, side bearings, thrust washers, and case assembly. P-3**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals.
 - Using service information, locate a procedure for servicing the final drive unit. Include appropriate torque specifications. Make sure the procedure is appropriate for the make and model of the vehicle.
 - Service the final drive assembly.

- **Inspect lubrication devices (oil pump or slingers); perform necessary action P-3**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals. Record the necessary information in the following space. Remove all gasket material from the case, extension housing, side plate, and input shaft bearing retaining collar.
 - Using service information, locate a procedure for measure each critical clearance. Make sure the procedure is appropriate for the make and model of the vehicle.
 - Inspect the oil pump components and oil slingers.
 - Using service information, locate a procedure for reassembling the manual transmission. Make sure the appropriate for the make and model of the vehicle to be serviced.
 - Bench test the transmission to ensure all parts turn freely and shift smoothly in all gears.
 - Using service information, locate a procedure for reassembling the manual transmission. Make sure the appropriate for the make and model of the vehicle to be serviced.
 - Bench test the transmission to ensure all parts turn freely and shift smoothly in all gears.
 - Using service information, locate a procedure for reassembling the manual transaxle. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for measuring and correct the critical clearances for manual transaxle components. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for inspecting, repairing, and replacing manual transaxle components. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.

- **Describe the operational characteristics of an electronically controlled manual transmission/transaxle. P-3**
Objective



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- **Inspect, test, and replace transmission/transaxle sensors and switches P-2**

Objective

- Wear PPE while performing the procedures on this job sheet.
- Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals. Record the necessary information in the following space. Remove all gasket material from the case, extension housing, side plate, and input shaft bearing retaining collar.
- Using service information, locate a procedure for servicing the speedometer drive components. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
- Using service information, locate a procedure for testing and replacing transmission/transaxle sensors. Include testing with a scan tool and DMM. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
- Using service information, locate a procedure for testing and replacing transmission/transaxle switches. Include testing with a scan tool and DMM. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.

Driver Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair

- **Diagnose constant-velocity (CV) joint noise and vibration concerns; determine necessary action P-1**

Objective

- Wear PPE while performing the procedures on this job sheet.
- Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals.
- Using service information, locate a procedure for testing CV-joints for wear. Include the procedures for inspecting the rubber boots that cover the CV-joint. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
- Road test the vehicle.
- Determine the necessary action to correct any problems. Include further diagnosis and repairs.

- **Diagnose universal joint noise and vibration concerns; perform necessary tasks P-2**

Objective

- Wear PPE while performing the procedures on this job sheet.
- Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals.
- Using service information, locate a procedure for diagnosing unusual drive shaft noises. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
- Using service information, locate a procedure for diagnosing drive shaft vibration. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
- Using service information, locate a procedure for checking drive shaft balance. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
- Using service information, locate a procedure for measuring drive shaft runout. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.



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- Using service information, locate a procedure for measuring driveline angles. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
- Using service information, locate a procedure for adjusting drive shaft and u-joint. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
- Using service information, locate a procedure for servicing drive center support bearing. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced

- **Remove and replace front-wheel-drive (FWD) front-wheel bearing P-1**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals
 - Using service information, locate a procedure for servicing the front wheel bearings on a front-wheel-drive vehicle. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced

- **Inspect, service, and replace shafts, yokes, boots, and CV-joints P-1**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals
 - Using service information, locate a procedure for removing the half shaft and CV-joints. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Clean and service the CV joints.
 - a. clean the CV joint with an appropriate solvent and blow dry
 - b. Inspect the CV joint for signs of wear.
 - Using service information, locate a procedure for disassembling the CV joint. Make sure the procedure is appropriate for the make and model of the vehicle.

- **Inspect, service, and replace shaft center support bearings P-3**
Objective
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals.
 - Using service information, locate a procedure for diagnosing unusual drive shaft noises. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for diagnosing drive shaft vibration. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for checking drive shaft balance. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for measuring drive shaft runout. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.



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COURSE SYLLABUS

- Using service information, locate a procedure for measuring driveline angles. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for adjusting drive shaft and u-joint. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for servicing drive center support bearing. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced
- **Check shaft balance and phasing; measure shaft run-out; measure and adjust driveline angles P-2**
 - **Objective**
 - Wear PPE while performing the procedures on this job sheet.
 - Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals.
 - Using service information, locate a procedure for diagnosing unusual drive shaft noises. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for diagnosing drive shaft vibration. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for checking drive shaft balance. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for measuring drive shaft runout. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for measuring driveline angles. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for adjusting drive shaft and u-joint. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced.
 - Using service information, locate a procedure for servicing drive center support bearing. Include all necessary specifications. Make sure the procedure is appropriate for the make and model of the vehicle to be serviced

ASSESSMENT METHODS:

Student performance may be assessed by examination, quizzes, case studies, oral conversation, group discussion, oral presentations. The instructor reserves the option to employ one or more of these assessment methods during the course.

GRADING SCALE:

90%-100% = A
80%-89.9% = B
70%-79.9% = C
60%-69.9% = D
<60% = E