

## **Occupation Appendix**

### **Miami-Dade County Public Schools (Sponsor)**

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In the occupation of:

<b>Occupation / Trade</b>	<b>NAICS Code</b>	<b>RAPIDS Code</b>	<b>O-Net Code</b>
<b>Automotive Service Mechanic</b>	<b>336310</b>	<b>90677</b>	<b>49-3023.00</b>

### **OUTREACH JURISDICTIONAL AREA**

**Miami-Dade**  
**(Counties)**

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Amended - 12/16/2021

Amended - 9/15/2022

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## DEFINITIONS

For the purposes of this appendix. The following definitions apply:

**COMPETENCY-BASED:** An apprenticeship training approach that requires the attainment of manual, mechanical, or technical skills and knowledge, as specified by an occupation standard, and demonstrated by an appropriate written and hands-on proficiency measurement. A minimum of 2,000 hours of on-the-job training is required.

**HYBRID-BASED:** An apprenticeship training approach that measures the individual apprentice's skill acquisition through a combination of a specified range of minimum and maximum number of hours of on-the-job training and the successful demonstration of competency as described in a work process schedule. Hybrid-Based is a combination of both the Time-Based and Competency-Based apprenticeship training approaches. A minimum of 2,000 hours of on-the-job training is required.

**TIME-BASED:** An apprenticeship training approach that measures the attainment of manual, mechanical, or technical skills and knowledge through the individual apprentice's completion of at least 2,000 hours of on-the-job training as described in a work process outline.

## SECTION XVI – TERM OF APPRENTICESHIP AND TRAINING APPROACH – 6A-23.004(2)(b), (d) FAC ~Amended 12-16-2021

### On-the-Job-Training:

The term of the apprenticeship shall be 3000 – 4000 hours of on-the-job training (including the probationary period).

Hours for related instruction are excluded.

### Related Technical Instruction:

Apprentices employed under these standards shall complete a minimum of 1,800 hours of supplemental instruction in technical subjects related to the occupation.

### Training Approach:

Time-Based       Competency-Based       Hybrid       Career-Lattice

### Related Instruction Delivery Method (select all that apply):

- Classroom
- Correspondence / Shop
- Web-Based Learning

### Related Instruction Delivery Provider (select all that apply):

- Sponsor / Employer Facility
- Community College / Technical School
- Vocational School (Technical College / Center)
- Other (specify) \_\_\_\_\_

### Related Instruction hours are provided (mark only one):

During Work Hours;       During Non-Work Hours; or       During Work & Non-Work Hours

Are Wages Paid to the Apprentice During Related Technical Instruction?    Yes    No

### Location(s) where related instruction will occur:

School Name:	D. A. Dorsey Technical College	Address	7100 NW 17th Ave, Miami, FL 33147
Contact:	Randy Holmes	Phone:	(305) 557-1100 Ext. 2441
		Email:	Rholmes@dadeschools.net

School Name:	Lindsey Hopkins Technical College	Address	750 NW 20th St, Miami, FL 33127
Contact:	Randy Holmes	Phone:	(305) 557-1100 Ext. 2441
		Email:	Rholmes@dadeschools.net

<b>School Name:</b>	Miami Lakes Technical College	<b>Address</b>	5780 NW 158th St, Miami Lakes, FL 33014		
<b>Contact:</b>	Randy Holmes	<b>Phone:</b>	(305) 557/1100 Ext. 2441	<b>Email:</b>	Rholmes@dadeschools.net

<b>School Name:</b>	Robert Morgan Technical College	<b>Address</b>	28300 SW 152nd Ave, Homestead, FL 33033		
<b>Contact:</b>	Randy Holmes	<b>Phone:</b>	(305) 557-1100 Ext. 2441	<b>Email:</b>	Rholmes@dadeschools.net

<b>School Name:</b>	South Dade Skills Center	<b>Address</b>	28300 SW 152nd Ave, Homestead, FL 33033		
<b>Contact:</b>	Randy Holmes	<b>Phone:</b>	(305) 557-1100 Ext. 2441	<b>Email:</b>	Rholmes@dadeschools.net

<b>School Name:</b>	WH Training, LLC	<b>Address</b>	2300 NW 151 <sup>st</sup> Street, Miami, FL. 33181		
<b>Contact:</b>	Randy Holmes	<b>Phone:</b>	(305) 557-1100 Ext. 2441	<b>Email:</b>	Rholmes@dadeschools.net

<b>Course(s)/Program(s) Name(s):</b>	<b>Program Number:</b>	<b>CIP Number:</b>
Automotive Service Technology	I47060R	0647060405

**SECTION XVII – PROBATIONARY PERIOD – 6A-23.004(2)(h, s) FAC**

Apprentices employed under these standards shall be subject to a probationary period during the first 500 hrs. of the apprenticeship program, which cannot exceed twenty-five percent (25%) of the length of the program or one (1) year, whichever is shorter.

**SECTION XVIII – RATIO OF APPRENTICES – 6A-23.004(2)(g) FAC**

It shall be the responsibility of the apprenticeship committee/sponsor to ensure that the allowable ratio of apprentices to journeyworkers is consistently maintained in the program as a whole, by each participating employer, and on the job site.

- The ratio of apprentices to journeyworkers consistent with proper supervision, training, safety, and continuity of employment shall be in a ratio of not more than three (3) apprentices for every one (1) master mechanic or two (2) apprentices for every one (1) specialty mechanic.

If the ratio for non-construction related programs is different from the construction related ratio, a variance must be requested by the Apprenticeship Committee or Program Sponsor and approved by the Department.

**SECTION XIX – QUALIFICATIONS AND SELECTION PROCEDURES – 6A-23.004(2)(j) FAC, 29 CFR § 30.5**

Applicants for apprenticeship shall meet minimum qualifications as outlined in this Appendix. These qualification standards, and the score required on any standard for admission to the applicant pool must be directly related to job performance, as shown by a statistical relationship between the score required for admission and performance in the apprenticeship program.

**MINIMUM QUALIFICATIONS:** Apprentice applicants must be able to meet all employment guidelines and requirements. All applicants will be considered without attention to race, color, religion, sex, sexual orientation, gender identity, national origin, veteran, or disability status and afforded equal opportunity.

a. **Age (Required)**

The minimum age qualification required by the Apprenticeship Committee, Sponsor, or Participating Employer for persons entering the Apprenticeship Program is: 18 years.

b.  **Physical**

Applicants will be physically capable of performing the essential functions of the occupation, with or without a reasonable accommodation, and without posing a direct threat to the health and safety of the individual or others. Applicants must be able to lift and carry 50 lbs.

Applicants will provide: Attestation stating apprentice is able to lift and carry 50 lbs.

c.  **English Language**

Applicants must be able to comprehend instructions on the job and in related training classes, and to ensure personal and co-worker safety on the job.

d.  **Drivers' License**

Applicants must possess and maintain a current and valid drivers' license with picture I.D.

**SELECTION PROCEDURES:**

**\*\* No matter which selection process an Apprenticeship Committee or Sponsor adopts, Veterans who have received discharges other than dishonorable discharges and Florida Registered Preapprentice Graduates shall, if qualified, receive the same priorities.**

The Apprenticeship Committee or Sponsor shall select apprentices from qualified applicants using one of the following appropriate selection methods examples:

1.  **Alternative Selection Method:**

a.  **Intent to Hire:**

- i. Applicants for apprenticeship must apply to the Apprenticeship Committee or Sponsor;
- ii. The applicant is screened by the Apprenticeship Committee or Sponsor on the basis of selection criteria (applicant minimum qualifications) approved by the Registration Agency;
- iii. Applicants who meet the screening requirements, and are accepted by the Apprenticeship Committee or Sponsor as eligible for apprenticeship, are then referred to participating employers who are hiring;
- iv. If the employer states in writing to the Apprenticeship Committee or Sponsor, their intent to hire an eligible applicant referred, that applicant is hired by the participating employer and registered by the Apprenticeship Committee or Sponsor.

2.  **Reinstatement:**

The program committee may reinstate apprentices previously registered to them within (2) years of their date of cancellation, without requiring these specific individuals to make application, meet minimum qualifications and then advance through the selection process. The program sponsor should include the process they use for reinstatement including previous apprentices in good standing with the program sponsor including timeframes that may exceed (2) years for reinstatement.

(ATR's should work with the program sponsor concerning their need to include a reinstatement process as appropriate)

**SECTION XX – AFFIRMATIVE ACTION WORKFORCE ANALYSIS – 6A-23.004(2)(y) FAC**

**Occupation: Automotive Service Mechanic**

<b>Underutilization Factors:</b>	
1. Total number of employers:	1
2. Total of employer(s) workforce:	165
3. Total journeyworkers employed by the employer(s) in the occupation:	85
4. Total female journeyworkers employed by the employer(s) in the occupation:	1
5. Total minorities journeyworkers employed by the employer(s) in the occupation:	69
6. Total youth journeyworkers age 16-24 employed by the employer(s) in the occupation:	21

<b>** 7 thru 11 do not apply to new programs</b>	
7. Total apprentices:	
8. Total female apprentices:	
9. Total minorities apprentices:	
10. Under-utilization of females:	%
11. Under-utilization of minorities:	%

<b>Goals and Timetables (all future accessions at each interval):</b>	
1. Percentage of all future accessions and at each interval to be females:	26 %
2. Percentage of all future accessions and at each interval to be minorities:	44 %

**\*\* Duplicate this page for each additional occupation, if applicable**

**SECTION XXI – WORK PROCESS AND RELATED TECHNICAL INSTRUCTION – 01-23.04(2); 0, 0) FAC**

**WORK PROCESS SCHEDULE**

**OCCUPATION:** Automotive Service Mechanic

**O\*NET CODE:** 49-3023.00      **RAPIDS CODE:** 90677

**Automotive Services Assistor –**  
01.0 Proficiently explain and apply required shop and personal safety tasks relating to the automotive industry.  
02.0 Explain and apply required tasks associated with the proper use and handling of tools and equipment relating to the automotive industry.  
03.0 Demonstrate proficiency in preparing vehicle for routine pre/post maintenance and customer services  
The apprentice has successfully completed the Competencies listed above:  
Employer Name: \_\_\_\_\_  
Employer Signature: \_\_\_\_\_  
Date OJT Section 01-03 Completed: \_\_\_\_\_  
Total Minimum & Maximum Hours: 500 - 700

**Engine Repair Technician –**  
04.0 Explain and apply proficiently the diagnosis, service and repair of engines, cylinder heads, valve train, engine block, lubrication and cooling systems.  
The apprentice has successfully completed the Competencies listed above:  
Employer Name: \_\_\_\_\_  
Employer Signature: \_\_\_\_\_  
Date OJT Section 04 Completed: \_\_\_\_\_  
Total Minimum & Maximum Hours: 250 - 316

**Automatic Transmission and Transaxle Technician –**  
05.0 Explain and apply proficiently the diagnosis, service, repair and overhaul of automatic transmissions/transaxles.  
The apprentice has successfully completed the Competencies listed above:  
Employer Name: \_\_\_\_\_  
Employer Signature: \_\_\_\_\_  
Date OJT Section 05 Completed: \_\_\_\_\_  
Total Minimum & Maximum Hours: 250 - 317

**Manual Drivetrain and Axle Technician –**  
06.0 Explain and apply proficiently the operation, assembly, diagnosis, service and repair of manual drivetrains, clutches, transmissions/transaxles, drive and half-shaft universals, constant velocity joints, rear axle differential assembly, limited slip, four-wheel drive and all-wheel drive transmissions/transaxles.  
The apprentice has successfully completed the Competencies listed above:  
Employer Name: \_\_\_\_\_  
Employer Signature: \_\_\_\_\_  
Date OJT Section 06 Completed: \_\_\_\_\_  
Total Minimum & Maximum Hours: 250 - 317

**Automotive Suspension and Steering Technician –**

07.0 Explain and apply proficiently the diagnosis, service and repair of front and rear suspensions systems, wheel alignment, and wheels and tires.

The apprentice has successfully completed the Competencies listed above:

Employer Name: \_\_\_\_\_

Employer Signature: \_\_\_\_\_

Date OJT Section 07 Completed: \_\_\_\_\_

Total Minimum & Maximum Hours: 250 - 317

**Automotive Brake System Technician –**

08.0 Explain and apply proficiently the diagnosis, service and repair of drum/disc brake, hydraulics, power assist units, electronic brakes, traction control, stability control systems and miscellaneous (wheel bearings, parking brake, electrical, etc.) systems.

The apprentice has successfully completed the Competencies listed above:

Employer Name: \_\_\_\_\_

Employer Signature: \_\_\_\_\_

Date OJT Section 08 Completed: \_\_\_\_\_

Total Minimum & Maximum Hours: 250 - 317

**Automotive Electrical/Electronic System Technician –**

09.0 Explain and apply proficiently the diagnosis, service and repair of electrical/electronic system components, battery, starting, charging, lighting, gauges, warning devices, driver information, horn, wiper/washer and accessory systems.

The apprentice has successfully completed the Competencies listed above:

Employer Name: \_\_\_\_\_

Employer Signature: \_\_\_\_\_

Date OJT Section 09 Completed: \_\_\_\_\_

Total Minimum & Maximum Hours: 500 - 700

**Automotive Heating and Air Conditioning Technician –**

10.0 Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling

The apprentice has successfully completed the Competencies listed above:

Employer Name: \_\_\_\_\_

Employer Signature: \_\_\_\_\_

Date OJT Section 10 Completed: \_\_\_\_\_

Total Minimum & Maximum Hours: 250 - 316

**Automotive Engine Performance Technician –**

11.0 Explain and apply proficiently the diagnosis, service and repair of engines, ignition, fuel, air induction, exhaust, computer, engine and emission control systems.

The apprentice has successfully completed the Competencies listed above:

Employer Name: \_\_\_\_\_

Employer Signature: \_\_\_\_\_

Date OJT Section 11 Completed: \_\_\_\_\_

**Total Minimum & Maximum Hours: 500 - 700**

**TOTAL MINIMUM - MAXIMUM HOURS: 3,000 – 4,000**

**RELATED TECHNICAL INSTRUCTION OUTLINE**

\*\* The passing of third party industry certification may not be used as a determining factor for the successful completion of the apprenticeship program. Third party industry certifications results may only be used as an instructional tool to assess individual apprentice progress and will not be used as a pass/fail determination\*\*

**OCCUPATION:** Automotive Service Mechanic

**O\*NET CODE:** 49-3032.00      **RAPIDS CODE:** 90677

<b>01 - Proficiently explain and apply required shop and personal safety tasks relating to the automotive industry</b>
Identify and apply general shop safety rules and procedures, EPA and OSHA standards.
Demonstrate knowledge of appropriate automotive industry certifications.
Identify and define career opportunities in the automotive service industry.
Research, identify, and interpret the Federal Law as recorded in (29 CFR-1910.1200).
Identify appropriate emergency first aid procedures.
Utilize and demonstrate safe procedures for handling of tools and equipment.
Identify and use proper placement of floor jacks and jack stands.
Identify and use proper procedures for safe lift operation.
Utilize proper ventilation procedures for working within the lab/shop area.
Identify proper procedures for safe pit usage.
Identify marked safety areas.
Identify the location and the types of fire extinguishers and other fire safety equipment.
Demonstrate knowledge of the procedures for using fire extinguishers and other safety equipment.
Identify the location and use of eye wash stations.
Identify the location of the posted evacuation routes.
Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
Identify and wear appropriate clothing for lab/shop activities.
Secure hair and jewelry for lab/shop activities.
Use proper handling procedures for automotive fluids.
Identify and describe typical automotive lubricants and lubricant properties.
Identify and describe typical automotive seals and gaskets.
Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.
Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.
Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)
Locate and demonstrate knowledge of Safety Data Sheets (SDS).
<b>02 - Explain and apply required tasks associated with the proper use and handling of tools and equipment relating to the automotive industry</b>
Identify tools and equipment and their appropriate usage in automotive applications.
Identify and use standard and metric measurement skills and designation.
Demonstrate proper cleaning, storage, and maintenance of tools and equipment.
Demonstrate proper use of precision-measuring tools (i.e. micrometer, digital/dial-indicator, digital/dial caliper) and torque methods.
<b>03 - Demonstrate proficiency in preparing vehicle for routine pre/post maintenance and customer services</b>
Identify information needed and the service requested on a repair order.
Identify automobiles according to engine location, cylinders, type of drive system, purpose, etc.
Identify purpose and demonstrate proper use of fender covers, floor mats and other vehicle protection equipment.
Demonstrate use of the three C's (Concern, Cause, and Correction).
Review vehicle service history.

Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
Conduct an appropriate pre-service evaluation and report or note any concerns not already on the repair order.
Determine the presence of a Tire Pressure Monitoring System (TPMS).
Determine the presence of wheel locks.
Determine the presence of an air suspension system.
Check operation and status of instrument panel warning lights and gauges.
Locate and use Vehicle identification Number (VIN) vehicle information placards, decals, tags, as required.
Demonstrate proficiency in manufacturer electronic service information system, including flat rate manuals, technical service bulletins and replacement part identification; where applicable.
Use proper chemicals for cleaning and lubrication.
Reset maintenance indicators; as applicable.
Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).
Inspect under-hood area for leaks, damage, and unusual conditions.
Determine fluid type requirements and identify fluid.
Check engine oil level and condition; service as required.
Check engine coolant level and condition; service as required.
Check power steering fluid level and condition; service as required.
Check brake fluid level and condition; service as required.
Check hydraulic clutch fluid and condition; service as required.
Check windshield washer fluid level and condition; service as required.
Check automatic transmission fluid level and condition; service as required.
Inspect undercar area for leaks, damage, and unusual conditions.
Check differential/transfer case fluid level; note unusual conditions; service as required.
Check manual transmission fluid level; note unusual conditions; service as required.
Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear.
Lubricate driveline, suspension and steering systems; as applicable.
Inspect cooling system pipes and hoses for wear, damage, and proper routing.
Change engine oil and filter.
Inspect and replace fuel filters; as applicable.
Inspect and replace air filter.
Inspect and replace cabin air filter.
Inspect, replace and adjust drive belts; inspect tensioners and pulleys.
Document observed damage, unusual conditions, and concerns.
Inspect struts, springs, and related components; service as required.
Inspect stabilizer bar, bushings, brackets, and links; service as required.
Inspect springs, torsion bars, and related components; service as required.
Inspect shock absorbers and related components.
Inspect constant velocity (CV) axle shaft boots; service as required.
Identify service considerations when equipped with a Tire Pressure Monitoring System (TPMS).
Identify nitrogen-filled tires.
Inspect tires, diagnose tire wear patterns, inspect spare and mounting system; check and adjust tire pressure; where applicable.
Rotate tires according to manufacturer's recommendations.
Balance wheel and tire assembly (static, dynamic and road force balance); where applicable.
Dismount, inspect, and remount tire on wheel.
Repair tire according to industry standards.
Reinstall wheel; torque wheel fasteners to specification.
Check wheel bearings for play and other signs of wear.
Perform a visual inspection of a brake drum system.
Perform a visual inspection of a disc brake system.
Check parking brake operation; check parking brake components for unusual conditions.

Lubricate door latches and hinges.
Inspect fuel tank, fuel cap and seal; inspect and replace fuel lines, fittings, and hoses; as applicable.
Perform slow/fast battery charge.
Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed.
Perform battery, starting, and charging system tests using appropriate tester.
Start a vehicle using jumper cables or a battery auxiliary power supply (jump box).
Maintain or restore electronic memory functions if required.
Inspect and test fusible links, circuit breakers, and fuses; confirm proper circuit operation; replace as needed.
Inspect and replace exterior and courtesy lamps.
<b>TOTAL RTI HOURS: 300 hrs.</b>
The apprentice has successfully completed the Standards and Benchmarks listed above
Instructor Name: _____
Instructor Signature: _____
Date RTI Section 01-03 Completed: _____

<b>ENGINE REPAIR TECHNICIAN</b>
<b>04 - Explain and apply proficiently the diagnosis, service and repair of engines, cylinder heads, valve train, engine block, lubrication and cooling systems</b>
<b>General: Engine Diagnosis; Removal and Reinstallation (R&amp;R)</b>
Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
Research vehicle service information including fluid type, internal engine operation, vehicle service history, service precautions, and technical service bulletins.
Verify operation of the instrument panel engine warning indicators.
Inspect engine assembly for fuel, oil, coolant, and other leaks; determine needed action.
Install engine covers using gaskets, seals, and sealers as required.
Verify engine mechanical timing.
Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.
Identify service precautions related to service of the internal combustion engine of a hybrid vehicle.
Identify and interpret engine concern; determine necessary action.
Locate and interpret vehicle and major component identification numbers.
Diagnose the cause of excessive oil consumption, coolant consumption, unusual engine exhaust color and odor; determine necessary action.
Perform engine vacuum tests; determine necessary action.
Perform cylinder power balance tests; determine necessary action.
Perform cylinder cranking and running compression tests; determine necessary action.
Perform cylinder leakage tests; determine necessary action.
<b>Cylinder Head and Valve Train Diagnosis and Repair</b>
Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specification and procedure.
Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.
Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine needed action.
Adjust valves (mechanical or hydraulic lifters).
Inspect and replace camshaft and drive belt/chain; includes checking drive gear wear and backlash, end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tone-wheel, and valve timing components; verify correct camshaft timing.
Establish camshaft position sensor indexing.
Inspect valve springs for squareness and free height comparison; determine needed action.
Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine needed action.
Inspect valve guides for wear; check valve stem-to-guide clearance; determine needed action.
Inspect valves and valve seats; determine needed action.
Check valve spring assembled height and valve stem height; determine needed action.
Inspect valve lifters; determine needed action.
Inspect and/or measure camshaft for runout, journal wear and lobe wear.
Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine needed action.
<b>Engine Block Assembly Diagnosis and Repair</b>
Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer).
Disassemble engine block; clean and prepare components for inspection and reassembly.
Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine needed action.
Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine needed action.
Deglaze and clean cylinder walls.
Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine needed action.

Inspect crankshaft for straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition; measure end play and journal wear; check crankshaft position sensor reluctor ring (where applicable); determine needed action.
Inspect main and connecting rod bearings for damage and wear; determine needed action.
Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine needed action.
Inspect and measure piston skirts and ring lands; determine needed action.
Determine piston-to-bore clearance.
Inspect, measure, and install piston rings.
Inspect auxiliary shaft(s) (balance, intermediate, idler, counterbalance and/or silencer); inspect shaft(s) and support bearings for damage and wear; determine needed action; reinstall and time.
Assemble engine block.
Remove and replace piston pin; where applicable.
<b>Lubrication and Cooling Systems Diagnosis and Repair</b>
Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, heater core, and galley plugs; determine needed action.
Identify causes of engine overheating.
Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.
Inspect and/or test coolant; drain and recover coolant; flush and refill cooling system; use proper fluid type per manufacturer specification; bleed air as required.
Inspect, remove, and replace water pump.
Remove and replace radiator.
Remove, inspect, and replace thermostat and gasket/seal.
Inspect and test fan(s), fan clutch (electrical or mechanical), fan shroud, and air dams; determine needed action.
Perform oil pressure tests; determine needed action.
Perform engine oil and filter change; use proper fluid type per manufacturer specification.
Inspect auxiliary coolers; determine needed action.
Inspect, test, and replace oil temperature and pressure switches and sensors.
Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform needed action.
Inspect and replace engine cooling and heater system hoses.
<b>Engine Repair Technician</b>
<b>TOTAL RTI HOURS: 150 hrs.</b>
The apprentice has successfully completed the Standards and Benchmarks listed above
Instructor Name: _____
Instructor Signature: _____
Date RTI Section 04 Completed: _____

**AUTOMATIC TRANSMISSION AND TRANSAXLE TECHNICIAN**

**05 - Explain and apply proficiently the diagnosis, service, repair and overhaul of automatic transmissions/transaxles.**

**General: Transmission and Transaxle Diagnosis**

Identify and interpret transmission/transaxle concerns, differentiate between engine performance and transmission/transaxle concerns; determine needed action.

Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.

Diagnose fluid loss and condition concerns; determine needed action.

Check fluid level in a transmission or a transaxle equipped with a dip-stick.

Check fluid level in a transmission or a transaxle not equipped with a dip-stick.

Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine needed action.

Diagnose noise and vibration concerns; determine needed action.

Perform stall test; determine needed action.

Perform lock-up converter system tests; determine needed action.

Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.

Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information.

Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law).

**In-Vehicle Transmission/Transaxle Maintenance and Repair**

Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch.

Inspect for leakage; replace external seals, gaskets, and bushings.

Inspect, test, adjust, repair, and/or replace electrical/electronic components and circuits including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses; demonstrate understanding of the relearn procedure.

Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.

Inspect, replace and align powertrain mounts.

Diagnose electronic transmission control systems using a scan tool; determine necessary action.

**Off-Vehicle Transmission and Transaxle Repair**

Inspect, leak test, flush, and/or replace transmission/transaxle oil cooler, lines, and fittings.

Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore.

Describe the operational characteristics of a continuously variable transmission (CVT).

Describe the operational characteristics of a hybrid vehicle drive train.

Disassemble, clean, and inspect transmission/transaxle.

Inspect, measure, clean, and replace valve body (includes surfaces, bores, springs, valves, switches, solenoids, sleeves, retainers, brackets, check valves/balls, screens, spacers, and gaskets).

Inspect servo and accumulator bores, pistons, seals, pins, springs, and retainers; determine needed action.

Assemble transmission/transaxle.

Inspect, measure, and reseal oil pump assembly and components.

Measure transmission/transaxle end play and/or preload; determine needed action.

Inspect, measure, and/or replace thrust washers and bearings.

Inspect oil delivery circuits, including seal rings, ring grooves, and sealing surface areas, feed pipes, orifices, and check valves/balls.

Inspect bushings; determine needed action.

Inspect and measure planetary gear assembly components; determine needed action.

Inspect case bores, passages, bushings, vents, and mating surfaces; determine needed action.

Diagnose and inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings; perform needed action.

Inspect measure, repair, adjust or replace transaxle final drive components.

Inspect clutch drum, piston, check-balls, springs, retainers, seals, friction plates, pressure plates, and bands; determine needed action.

Measure clutch pack clearance; determine needed action.

Air test operation of clutch and servo assemblies.

Inspect one-way clutches, races, rollers, sprags, springs, cages, retainers; determine needed action.

Install and seat torque converter to engage drive/splines.

Inspect bands and drums; determine necessary action.

**Automatic Transmission and Transaxle Technician**

**TOTAL RTI HOURS: 150 hrs.**

The apprentice has successfully completed the Standards and Benchmarks listed above

Instructor Name: \_\_\_\_\_

Instructor Signature: \_\_\_\_\_

Date RTI Section 05 Completed: \_\_\_\_\_

**MANUAL DRIVETRAIN AND AXLE TECHNICIAN**

**06 - Explain and apply proficiently the operation, assembly, diagnosis, service and repair of manual drivetrains, clutches, transmissions/transaxles, drive and half-shaft universals, constant velocity joints, rear axle differential assembly, limited slip, four-wheel drive and all-wheel drive**

**General: Drive Train Diagnosis**

Identify and interpret drive train concerns; determine needed action.

Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.

Check fluid condition; check for leaks; determine needed action.

Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification.

Diagnose fluid loss, level, and condition concerns; determine necessary action.

**Clutch Diagnosis and Repair**

Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine needed action.

Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs.

Inspect and/or replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing, linkage, and pilot bearing/bushing (as applicable).

Bleed clutch hydraulic system.

Check and adjust clutch master cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification.

Inspect flywheel and ring gear for wear, cracks, and discoloration; determine needed action.

Measure flywheel runout and crankshaft end play; determine needed action.

Describe the operation and service of a system that uses a dual mass flywheel.

Inspect hydraulic clutch slave and master cylinders, lines, and hoses; determine necessary action.

Inspect engine block, core plugs, rear main engine oil seal, clutch (bell) housing, transmission/transaxle case mating surfaces, and alignment dowels; determine necessary action.

**Transmission/Transaxle Diagnosis and Repair**

Inspect, adjust, lubricate, and/or replace shift linkages, brackets, bushings, cables, pivots, and levers.

Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.

Diagnose noise concerns through the application of transmission/transaxle powerflow principles.

Diagnose hard shifting and jumping out of gear concerns; determine needed action.

Diagnose transaxle final drive assembly noise and vibration concerns; determine needed action.

Disassemble, inspect clean, and reassemble internal transmission/transaxle components.

Remove and reinstall manual transmission/transaxle.

Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents

Inspect, replace, and align powertrain mounts.

Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces.

Remove and replace transaxle final drive.

Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs.

Measure end play or preload (shim or spacer selection procedure) on transmission/transaxle shafts;

Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings.

Inspect lubrication devices (oil pump or slingers); perform necessary action.

Inspect, test, and replace transmission/transaxle sensors and switches.

**Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair (Front, Rear, All-Wheel, and Four-Wheel drive)**

Diagnose constant-velocity (CV) joint noise and vibration concerns; determine needed action.

Diagnose universal joint noise and vibration concerns; perform needed action.

Inspect, remove, and/or replace bearings, hubs, and seals.

Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints.

Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles.

Inspect, service, and replace shaft center support bearings.

**Drive Axle Diagnosis and Repair – Ring and Pinion Gears and Differential Case Assembly**

Clean and inspect differential case; check for leaks; inspect housing vent.
Check and adjust differential case fluid level; use proper fluid type per manufacturer specification.
Drain and refill differential case; use proper fluid type per manufacturer specifications.
Diagnose noise and vibration concerns; determine needed action.
Inspect and replace companion flange and/or pinion seal; measure companion flange runout.
Inspect ring gear and measure runout; determine needed action.
Remove, inspect, reinstall and/or drive pinion and ring gear, spacers, sleeves, and bearings.
Measure and adjust drive pinion depth.
Measure and adjust drive pinion bearing preload.
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).
Check ring and pinion tooth contact patterns; perform needed action.
Disassemble, inspect, measure, adjust, and/or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case.
Reassemble and reinstall differential case assembly; measure runout; determine needed action.
Diagnose noise and vibration concerns; determine necessary action.
<b>Drive Axle Diagnosis and Repair – Limited Slip Differential</b>
Diagnose noise, slippage, and chatter concerns; determine needed action.
Measure rotating torque; determine needed action.
Inspect and reinstall limited slip differential components.
<b>Drive Axle Diagnosis and Repair – Drive Axles</b>
Inspect and replace drive axle wheel studs.
Remove and replace drive axle shafts.
Inspect and replace drive axle shaft seals, bearings, and retainers.
Measure drive axle flange runout and shaft end play; determine needed action.
Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns;
<b>Four-Wheel Drive/All-Wheel Drive Component Diagnosis and Repair</b>
Inspect locking hubs; determine needed action.
Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.
Identify concerns related to variations in tire circumference and/or final drive ratios.
Diagnose noise, vibration, and unusual steering concerns; determine needed action.
Diagnose, test, adjust, and/or replace electrical/electronic components of 4-wheel drive/all-wheel drive systems.
Disassemble, service, and reassemble transfer case and components.
<b>Manual Drivetrain and Axle Technician</b>
<b>TOTAL RTI HOURS: 150 hrs.</b>
The apprentice has successfully completed the Standards and Benchmarks listed above
Instructor Name: _____
Instructor Signature: _____
Date RTI Section 06 Completed: _____

<b>AUTOMOTIVE SUSPENSION AND STEERING TECHNICIAN</b>
<b>07 - Explain and apply proficiently the diagnosis, service and repair of front and rear suspensions systems, wheel alignment, and wheels and tires</b>
<b>General: Suspension and Steering Systems</b>
Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.
Identify and interpret suspension and steering system concerns; determine needed action.
<b>Steering Systems Diagnosis and Repair</b>
Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.
Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).
Diagnose steering column noises, looseness, and binding concerns (including tilt/telescoping mechanisms); determine needed action.
Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.
Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.
Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; determine needed action.
Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.
Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed.
Inspect power steering fluid level and condition.
Flush, fill, and bleed power steering system; use proper fluid type per manufacturer specification.
Inspect for power steering fluid leakage; determine needed action.
Remove, inspect, replace, and/or adjust power steering pump drive belt.
Remove and reinstall power steering pump.
Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.
Inspect, remove and/or replace power steering hoses and fittings.
<b>Suspension Systems Diagnosis and Repair</b>
Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine needed action.
Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine needed action.
Inspect, remove, and/or replace upper and lower control arms, bushings, shafts, and rebound bumpers.
Inspect, remove, and/or replace strut rods and bushings.
Inspect, remove, and/or replace steering knuckle assemblies.
Inspect, remove, and/or replace strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.
Inspect, remove, and/or replace track bar, strut rods/radius arms, and related mounts and bushings.
Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.
<b>Related Suspension and Steering Service</b>
Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings.
Remove, inspect, service and/or replace front and rear wheel bearings.
Describe the function of suspension and steering control systems and components, (i.e. active suspension and stability control).
<b>Wheel Alignment Diagnosis, Adjustment, and Repair</b>
Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine needed action.
Perform pre-alignment inspection; measure vehicle ride height; determine needed action.
Prepare vehicle for wheel alignment on alignment machine; perform four-wheel alignment by checking and adjusting front and rear wheel caster, camber and toe as required; center steering wheel.
Check toe-out-on-turns (turning radius); determine needed action.
Check steering axis inclination (SAI) and included angle; determine needed action.

Check rear wheel thrust angle; determine needed action.
Check for front wheel setback; determine needed action.
Check front and/or rear cradle (sub-frame) alignment; determine needed action.
Reset steering angle sensor.
<b>Wheels and Tires Diagnosis and Repair</b>
Inspect tire condition; identify tire wear patterns; check for correct tire size, application (load and speed ratings), and air pressure as listed on the tire information placard/label.
Diagnose wheel/tire vibration, shimmy, and noise; determine needed action.
Rotate tires according to manufacturer's recommendation including vehicles equipped with tire pressure monitoring systems (TPMS)
Measure wheel, tire, axle flange, and hub runout; determine needed action.
Diagnose tire pull problems; determine needed action.
Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly.
Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.
Inspect tire and wheel assembly for air loss; perform needed action.
Repair tire following vehicle manufacturer approved procedure.
Reinstall wheel; torque lug nuts.
<b>Automotive Suspension and Steering Technician</b>
<b>TOTAL RTI HOURS: 150 hrs.</b>
The apprentice has successfully completed the Standards and Benchmarks listed above
Instructor Name: _____
Instructor Signature: _____
Date RTI Section 07 Completed: _____

## **AUTOMOTIVE BRAKE SYSTEM TECHNICIAN**

**08 – Explain and apply proficiently the diagnosis, service and repair of drum/disc brake, hydraulics, power assist units, electronic brakes, traction control, stability control systems and miscellaneous (wheel bearings, parking brake, electrical, etc.) systems**

### **General: Brake Systems Diagnosis**

Identify and interpret brake system concerns; determine needed action.

Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.

Describe procedure for performing a road test to check brake system operation including an anti-lock brake system (ABS).

Install wheel and torque lug nuts.

Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, calibration decals).

### **Hydraulic System Diagnosis and Repair**

Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).

Measure brake pedal height, travel, and free play (as applicable); determine needed action.

Check master cylinder for internal/external leaks and proper operation; determine needed action.

Remove, bench bleed, and reinstall master cylinder.

Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine needed action.

Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear; and loose fittings/supports; determine needed action.

Replace brake lines, hoses, fittings, and supports.

Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).

Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.

Inspect, test, and/or replace components of brake warning light system.

Identify components of hydraulic brake warning light system.

Bleed and/or flush brake system.

Test brake fluid for contamination.

Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves.

### **Drum Brake Diagnosis and Repair**

Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine needed action.

Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.

Refinish brake drum and measure final drum diameter; compare with specification.

Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.

Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.

Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.

### **Disc Brake Diagnosis and Repair**

Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine needed action.

Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action.

Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action.

Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action.

Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads; inspect for leaks.

Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action.

Remove and reinstall/replace rotor.

Refinish rotor on vehicle; measure final rotor thickness and compare with specification.

Refinish rotor off vehicle; measure final rotor thickness and compare with specification.

Retract and re-adjust caliper piston on an integrated parking brake system.

Check brake pad wear indicator; determine needed action.
Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.
Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts.
<b>Power-Assist Units Diagnosis and Repair</b>
Check brake pedal travel with and without engine running to verify proper power booster operation.
Identify components of the brake power assist system (vacuum and hydraulic); check vacuum supply (manifold or auxiliary pump) to vacuum- type power booster.
Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine needed action.
Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine needed action.
Measure and adjust master cylinder pushrod length.
<b>Related Systems (i.e. Wheel Bearings, Parking Brakes, Electrical) Diagnosis and Repair</b>
Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine needed action.
Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.
Check parking brake system and components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed.
Check parking brake operation and parking brake indicator light system operation; determine needed action.
Check operation of brake stop light system.
Replace wheel bearing and race.
Remove, reinstall, and/or replace sealed wheel bearing assembly.
Inspect and replace wheel studs.
<b>Electronic Brake Control Systems: Antilock Brake (ABS), Traction Control (TCS), and Electronic Stability Control (ESC) Systems Diagnosis and Repair</b>
Identify and inspect electronic brake control system components (ABS, TCS, & ESC); determine needed action.
Describe the operation of a regenerative braking system.
Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine needed action.
Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine needed action.
Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multi-meter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data).
Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).
<b>Automotive Brake System Technician</b>
<b>TOTAL RTI HOURS: 150 hrs.</b>
The apprentice has successfully completed the Standards and Benchmarks listed above
Instructor Name: _____
Instructor Signature: _____
Date RTI Section 08 Completed: _____

**AUTOMOTIVE ELECTRICAL/ELECTRONIC SYSTEM TECHNICIAN**

**09 – Explain and apply proficiently the diagnosis, service and repair of electrical/electronic system components, battery, starting, charging, lighting, gauges, warning devices, driver information, horn, wiper/washer and accessory systems**

**General: Electrical System Diagnosis**

Research vehicle service information including vehicle service history, service precautions, and technical service bulletins.

Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).

Demonstrate proper use of a digital multi-meter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance.

Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.

Demonstrate proper use of a test light on an electrical circuit.

Use fused jumper wires to check operation of electrical circuits.

Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems.

Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine needed action.

Inspect and test fusible links, circuit breakers, and fuses; determine needed action.

Inspect, test, repair, and/or replace components, connectors, terminals, harnesses, and wiring in electrical/electronic systems (including solder repairs); determine needed action.

Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs.

Repair data bus wiring harness.

Identify and interpret electrical/electronic system concern; determine necessary action.

Identify location of hybrid vehicle high voltage circuit disconnect (service plug) location and safety procedures.

**Battery Diagnosis and Service**

Perform battery state-of-charge test; determine needed action.

Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine needed action.

Maintain or restore electronic memory functions.

Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.

Perform slow/fast battery charge according to manufacturer's recommendations.

Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.

Identify safety precautions for high voltage systems on electric, hybrid, hybrid-electric, and diesel vehicles.

Identify electrical/electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.

Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.

Perform battery conductance test; determine necessary action.

**Starting System Diagnosis and Repair**

Perform starter current draw tests; determine needed action.

Perform starter circuit voltage drop tests; determine needed action.

Inspect and test starter relays and solenoids; determine needed action.

Remove and install starter in a vehicle.

Inspect and test switches, connectors, and wires of starter control circuits; determine needed action.

Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition.

Demonstrate knowledge of an automatic idle-stop/start-stop system.

**Charging System Diagnosis and Repair**

Perform charging system output test; determine needed action.

Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions.

Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.

Remove, inspect, and/or replace generator (alternator).

Perform charging circuit voltage drop tests; determine needed action.

**Lighting Systems Diagnosis and Repair**

Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine needed action.

Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.
Aim headlights.
Identify system voltage and safety precautions associated with high-intensity discharge headlights.
Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action.
<b>Instrument Cluster and Driver Information Systems Diagnosis and Repair</b>
Inspect and test gauges and gauge sending units for causes of abnormal readings; determine needed action.
Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine needed action.
Reset maintenance indicators as required.
Inspect and test sensors, connectors, and wires of electronic (digital) instrument circuits; determine necessary action.
<b>Body Electrical Systems Diagnosis and Repair</b>
Diagnose operation of comfort and convenience accessories and related circuits (such as: power window, power seats, pedal height, power locks, truck locks, remote start, moon roof, sun roof, sun shade, remote keyless entry, voice activation, steering wheel controls, back-up camera, park assist, cruise control, and auto dimming headlamps); determine needed repairs.
Diagnose operation of safety systems and related circuits (such as: horn, airbags, seat belt pretensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, park assist, and back-up camera); determine needed repairs.
Diagnose body electronic systems circuits using a scan tool; check for module communication errors (data communication bus systems); determine needed action.
Describe the process for software transfer, software updates, or reprogramming of electronic modules.
Diagnose incorrect heated glass, mirror, or seat operation; determine necessary action.
<b>TOTAL RTI HOURS: 300 hrs.</b>
The apprentice has successfully completed the Standards and Benchmarks listed above
Instructor Name: _____
Instructor Signature: _____
Date RTI Section 09 Completed: _____

**AUTOMOTIVE HEATING AND AIR CONDITIONING TECHNICIAN**

**10 – Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling**

**General: A/C System Diagnosis and Repair**

Identify and interpret heating and air conditioning problems; determine needed action.

Research vehicle service information including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins.

Performance test A/C system; identify problems.

Identify abnormal operating noises in the A/C system; determine needed action.

Identify refrigerant type; select and connect proper gauge set/test equipment; record temperature and pressure readings.

Leak test A/C system; determine needed action.

Inspect condition of refrigerant oil removed from A/C system; determine needed action.

Determine recommended oil and oil capacity for system application.

Using a scan tool, observe and record related HVAC data and trouble codes.

**Refrigeration System Component Diagnosis and Repair**

Inspect, remove, and/or replace A/C compressor drive belts, pulleys, tensioners and visually inspect A/C components for signs of leaks; determine needed action.

Inspect, test, service and/or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed.

Remove, inspect, reinstall, and/or replace A/C compressor and mountings; determine recommended oil type and quantity.

Identify hybrid vehicle A/C system electrical circuits and service/safety precautions.

Determine need for an additional A/C system filter; perform needed action.

Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform needed action.

Inspect for proper A/C condenser airflow; determine needed action.

Remove, inspect, and replace receiver/drier or accumulator/drier; determine recommended oil type and quantity.

Remove, inspect, and install expansion valve or orifice (expansion) tube.

Inspect evaporator housing water drain; perform needed action.

Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and/or control module) to interrupt system operation; determine needed action.

Determine procedure to remove and reinstall evaporator; determine required oil type and quantity.

Perform cooling system pressure tests; check coolant condition, inspect and test radiator, cap (pressure/vacuum), coolant recovery tank, and hoses; perform necessary action.

**Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair**

Inspect engine cooling and heater systems hoses and pipes; perform needed action.

Inspect and test heater control valve(s); perform needed action.

Diagnose temperature control problems in the HVAC system; determine needed action.

Determine procedure to remove, inspect, reinstall, and/or replace heater core.

Inspect, test, and replace thermostat and gasket/seal.

Determine coolant condition and coolant type for vehicle application; drain and recover coolant.

Flush system; refill system with recommended coolant; bleed system.

Inspect and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action.

Inspect and test electric cooling fan, fan control system and circuits; determine necessary action.

**Operating Systems and Related Controls Diagnosis and Repair**

Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action.

Diagnose A/C compressor clutch control systems; determine needed action.

Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine needed action.

Inspect and test HVAC system control panel assembly; determine needed action.

Inspect and test HVAC system control cables, motors, and linkages; perform needed action.

Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets; perform needed action.

Identify the source of HVAC system odors.

Check operation of automatic or semi-automatic HVAC control systems; determine needed action.

**Refrigerant Recovery, Recycling, and Handling**

Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards.

Identify A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required.

Recycle, label, and store refrigerant.

**Automotive Heating and Air Conditioning Technician**

**TOTAL RTI HOURS: 150 hrs.**

The apprentice has successfully completed the Standards and Benchmarks listed above

Instructor Name: \_\_\_\_\_

Instructor Signature: \_\_\_\_\_

Date RTI Section 10 Completed: \_\_\_\_\_

**AUTOMOTIVE ENGINE PERFORMANCE TECHNICIAN****11 – Explain and apply proficiently the diagnosis, service and repair of engines, ignition, fuel, air induction, exhaust, computer engine and emission control systems****General: Engine Diagnosis**

Identify and interpret engine performance concerns; determine needed action.

Research vehicle service information including vehicle service history, service precautions, and technical service bulletins.

Diagnose abnormal engine noises or vibration concerns; determine needed action.

Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine needed action.

Perform engine absolute manifold pressure tests (vacuum/boost); determine needed action.

Perform cylinder power balance test; determine needed action.

Perform cylinder cranking and running compression tests; determine needed action.

Perform cylinder leakage test; determine needed action.

Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine needed action.

Verify engine operating temperature; determine needed action.

Verify correct camshaft timing including engines equipped with variable valve timing systems (VVT).

Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.

Demonstrate knowledge of using a 4 or 5 gas analyzer, interpret readings, and determine necessary action.

Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.

**Computerized Controls Diagnosis and Repair**

Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear codes when applicable.

Access and use service information to perform step-by-step (troubleshooting) diagnosis.

Perform active tests of actuators using a scan tool; determine needed action.

Describe the use of OBD monitors for repair verification.

Diagnose the causes of emissions or drive-ability concerns with stored or active diagnostic trouble codes (DTC); obtain, graph, and interpret scan tool data.

Diagnose emissions or drive-ability concerns without stored or active diagnostic trouble codes; determine needed action.

Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multi-meter (GMM)/digital storage oscilloscope (DSO); perform needed action.

Diagnose drive-ability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, HVAC, automatic transmissions, non-OEM installed accessories, or similar systems); determine needed action.

Check for module communication (including CAN/BUS systems) errors using a scan tool.

**Ignition System Diagnosis and Repair**

Diagnose (troubleshoot) ignition system related problems such as no-starting, hard starting, engine misfire, poor drive-ability, spark knock, power loss, poor mileage, and emissions concerns; determine needed action.

Inspect and test crankshaft and camshaft position sensor(s); determine needed action.

Remove and replace spark plugs; inspect secondary ignition components for wear and damage.

Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action.

**Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair**

Diagnose (troubleshoot) hot or cold no-starting, hard starting, poor drive-ability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems; determine needed action.

Check fuel for contaminants; determine needed action.

Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume; perform needed action.

Replace fuel filter(s) where applicable.

Inspect, service, or replace air filters, filter housings, and intake duct work.

Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.

Inspect, test, and/or replace fuel injectors.

Verify idle control operation.
Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; perform needed action.
Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine needed action.
Perform exhaust system back-pressure test; determine needed action.
<b>Emissions Control Systems Diagnosis and Repair</b>
Diagnose oil leaks, emissions, and drive-ability concerns caused by the positive crankcase ventilation (PCV) system; determine needed action.
Inspect, test, service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; perform needed action.
Diagnose emissions and drive-ability concerns caused by the exhaust gas recirculation (EGR) system; inspect, test, service and/or replace electrical/electronic sensors, controls, wiring, tubing, exhaust passages, vacuum/pressure controls, filters, and hoses of exhaust gas recirculation (EGR) systems; determine needed action.
Diagnose emissions and drive-ability concerns caused by the secondary air injection system; inspect, test, repair, and/or replace electrical/electronically-operated components and circuits of secondary air injection systems; determine needed action.
Diagnose emissions and drive-ability concerns caused by the evaporative emissions control (EVAP) system; determine needed action.
Diagnose emission and drive-ability concerns caused by catalytic converter system; determine needed action.
Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action.
Adjust valves on engines with mechanical or hydraulic lifters; as applicable.
Remove and replace timing belt; verify correct camshaft timing.
Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.
Inspect engine oil and/or filter for condition and determine necessary action.
Identify hybrid vehicle internal combustion engine service precautions.
<b>Automotive Engine Performance Technician</b>
<b>TOTAL RTI HOURS: 300 hrs.</b>
The apprentice has successfully completed the Standards and Benchmarks listed above
Instructor Name: _____
Instructor Signature: _____
Date RTI Section 11 Completed: _____

**SECTION XXII – APPRENTICE WAGE SCHEDULE - 6A-23.004(2)(c) FAC (revised 09/15/2022)**

Apprentices shall be paid a progressively increasing schedule of wages based on a percentage and a dollar amount of the current hourly journeyworker wage rate, which is: \$ 20.00, as of 12 / 16 / 2021.

**Occupation:** Automotive Service Mechanic

Period of Training Min - Max	Competencies (per training period)	Percent of Journeyworker's Rate	Apprentice's Hourly Rate
500 - 700	1 thru 3	80%	16.00
1250 - 1584	4 thru 8	90%	17.00
1250 - 1716	9 thru 11	92.5%	18.50

**Age Name:** Warren Henry Group - W. H. Training, LLC

Apprentices shall be paid a progressively increasing schedule of wages based on a percentage and a dollar amount of the current hourly journeyworker wage rate, which is: \$ 20, as of 9 / 2 / 2022.

**Occupation:** Automotive Service Mechanic

Period of Training Min-Max	Competencies (per training period)	Present of Journeyworker's Rate	Apprentice's Hourly Rate
500 - 700	1 thru 3	75 %	\$15.00
1250- 1584	4 thru 8	80 %	\$16.00
1250 - 1716	9 thru 11	85 %	\$17.00

**SECTION XXIII -- LISTING OF PARTICIPATING EMPLOYERS -- 6A-23.004(2)(w) FAC**

Each Employer wishing to participate in this registered apprenticeship program shall sign a Participating Employer's Agreement with the Sponsor, unless otherwise provided for in a collective bargaining agreement and in so doing, will accept the requirements of the program standards. The Program Sponsor shall provide an executed copy of the signed Participating Employer's Agreement to the Registration Agency and the cancellation thereof.

Participating Employer	Participating Employer
W. H. Training, LLC	
Green's Garage	
Mercedes-Benz of Cutler Bay	

\*\*Add additional rows as needed

**COMPOSITION OF THE APPRENTICESHIP SUB-COMMITTEE (if applicable)**

The Apprenticeship Sub-Committee shall be comprised of representatives from the Participating Employers and stakeholder members, and a current list must be provided to the Department. The Apprenticeship Sub-Committee shall include a Chairperson and a Secretary. The Apprenticeship Sub-Committee shall meet on a regular basis and as often as necessary in order to properly oversee the Apprenticeship Program.

The Apprenticeship Sub-Committee will be composed of at least 4 member representatives.

The Apprenticeship Sub-Committee shall meet Semi-annually or as often as necessary to conduct business.

**SUB-COMMITTEE MEMBERS**

*(Print Name, Title, and Affiliation for Each.)*

[Chairperson] – Orestes Triana - Owner Greens Garage	[Secretary] – Randy Holmes, School Operations Miami-Dade County Public Schools
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**Members**

Raydel Leon – Service Director Mercedes-Benz of Cutler Bay	Dayron Gonzalez Barrios – Service Director Warren Henry Automotive Group
Ron Miranda – Automotive Instructor W. H. Training, LLC	George Sanchez - Automotive Instructor Miami Lakes Technical College

\*\*Add or remove Member boxes as needed

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Raydel Leon – Service Director Mercedes-Benz of Cutler Bay	Dayron Gonzalez Barrios – Service Director Warren Henry Automotive Group
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Add or remove Member boxes as needed

**OFFICIAL ADOPTION OF APPRENTICESHIP STANDARDS APPENDIX**

**M-DCPS Apprenticeship Program**

(Program Name)

hereby adopts this Appendix on this 15<sup>th</sup> day of March, 2021.

Signature of Program Chairperson

Signature of Program Secretary

Owner-Green Garage

School Operations

Title/Affiliation

Title/Affiliation

Orestes J. Triana

Randall Holmes

Printed Name

Printed Name

REVIEWED BY:

Apprenticeship & Training Representative

March 16, 2021

Date

REVIEWED

APPROVED

REGISTERED

FLORIDA DEPARTMENT OF EDUCATION  
DIVISION OF CAREER AND ADULT EDUCATION - APPRENTICESHIP

Authorized Official - Registration Agency

Date