

**Course Code:** AFD 111

**Course Title:** Automotive Powertrain Maintenance and Light Repair

**Department:** Applied Sciences and Technologies

**Effective Date:** Summer 2026

**PCS Code:** 1.2 - Occupational/Technical Instruction

**CIP Code:** 47.0604

**Repeatability:** 0

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## Credit Hours

**Catalog Notation:** 5-5-7

**Credit Hour Distribution:**

Lecture: 5

Lab: 5

Clinical: 0

**Total: 7**

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## General Course Information

### Catalog Description

Automotive gasoline internal combustion engine theory of operation. Engine mechanical condition inspection and testing. Cooling system operation, analysis, and testing. Drive axle services and repair.

### General Course Objectives

Students will gain the skills needed to test an internal combustion gasoline engine for compression, cylinder leakage, cooling system operation, and manifold vacuum. Students will also learn how to adjust valves and replace timing belts. Students will replace drive axles, hubs, bearings, and constant velocity (CV) joints.

### Minimum Placement Levels

English	Reading	Math
Placement into ENG 098	Placement into CCS 098	Placement into MAT 060

### Prerequisites

Credit in AFD 110

### Methods of Evaluation

Students will be given 5 practical exams:

- Engine compression test
- Micrometer measurement
- Engine cylinder leakage testing
- Verifications of engine timing
- Valve clearance adjustment

### Instructional Materials and Additional Supplies

None.

## Course Content

### General Learning Outcomes (GLOs)

- Reasoning and Inquiry: Students will demonstrate the ability to solve problems using deductive reasoning and logic, quantitative reasoning, or the scientific method.

### Course Segments and Student Learning Outcomes

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Automotive Safety Related to Engine Maintenance and Light Repair	1. Identify the safety concerns related to vehicle operation and service.	5	0	0
Engine Theory of Operation	1. Describe how the chemical energy in fuel is converted into heat energy by burning at a controlled rate. 2. Describe how the internal combustion engine converts heat energy into power. 3. Describe the chemical process needed for combustion. 4. Describe how the heat energy released through combustion creates the pressure needed in the combustion chamber to move a piston connected to a rotating crankshaft. 5. Define horsepower and torque.	10	0	0
Engine Testing	1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. 2. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action. 3. Perform cylinder power balance test; determine necessary action. 4. Perform cylinder cranking and running compression tests; determine necessary action. 5. Perform cylinder leakage test; determine necessary action. 6. Verify engine operating temperature. 7. Remove and replace spark plugs. 8. Inspect secondary ignition components for wear and damage.	10	16	0
Engine Valve Timing and Valve Adjustment	1. Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap valve, tubes, orifices, and hoses; perform necessary action. 2. Install engine covers using gaskets, seals, and sealers as required. 3. Remove and replace timing belt. 4. Correct camshaft timing. 5. Adjust valves (mechanical or hydraulic lifters).	11	18	0
Engine Cooling System Operation, Testing, Maintenance, and Light Repair	1. Perform cooling system pressure and dye tests to identify leaks. 2. Check coolant condition and level. 3. Inspect and test radiator, pressure cap, coolant recovery tank, heater core, and galley plugs; determine necessary action.	12	11	0

<b>Course Segment</b>	<b>Learning Outcomes</b>	<b>Lecture Hours</b>	<b>Lab Hours</b>	<b>Clinical Hours</b>
Automotive Transmission Theory and Operation	<ol style="list-style-type: none"> <li>1. Describe the operational characteristics of a continuously variable transmission (CVT).</li> <li>2. Describe the operational characteristics of a hybrid vehicle drive train.</li> <li>3. Describe the operational characteristics of an electronically controlled manual transmission/trans-axle.</li> <li>4. Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch.</li> <li>5. Inspect, replace, and align power train mounts.</li> <li>6. Drain and replace fluid in a manual transmission.</li> </ol>	14	8	0
Drive Axle Bearings, Hubs, Axle Operation and Service	<ol style="list-style-type: none"> <li>1. Inspect, remove, and replace front wheel drive (FWD) sealed bearings, hubs, and seals.</li> <li>2. Inspect, service, and replace shafts, yokes, boots, and universal/CV joints.</li> <li>3. Inspect front-wheel bearings and locking hubs.</li> <li>4. Drain and refill differential housing.</li> </ol>	13	22	0

**Total Contact Hours**

<b>Lecture Hours</b>	<b>Lab Hours</b>	<b>Clinical Hours</b>
75	75	0