



Western Technical College

## 32404353 Engine Repair

### Course Outcome Summary

#### Course Information

<b>Description</b>	Provides skills and technical knowledge in engine repair and maintenance under actual garage conditions. Includes diagnosis and repair of engine malfunctions, estimation of repair costs and parts ordering.
<b>Career Cluster</b>	Transportation, Distribution and Logistics
<b>Instructional Level</b>	Technical Diploma Courses
<b>Total Credits</b>	3
<b>Total Hours</b>	108

#### Textbooks

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

#### Learner Supplies

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

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

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

#### Success Abilities

1. Cultivate Passion: Enhance Personal Connections
2. Cultivate Passion: Expand a Growth-Mindset
3. Cultivate Passion: Increase Self-Awareness
4. Live Responsibly: Develop Resilience
5. Live Responsibly: Foster Accountability
6. Refine Professionalism: Act Ethically

7. Refine Professionalism: Improve Critical Thinking
8. Refine Professionalism: Participate Collaboratively
9. Refine Professionalism: Practice Effective Communication

## **Program Outcomes**

1. Demonstrate professionalism appropriate for the auto service industry.
2. Perform diagnosis, service, and repair of automotive internal combustion engines.

## **Course Competencies**

### **1. Diagnose cylinder head and valve train concerns.**

#### **Assessment Strategies**

- 1.1. Written Product
- 1.2. Skill Demonstration

#### **Criteria**

*You will know you are successful when:*

- 1.1. you select the correct [TOOLS, EQUIPMENT, INSTRUMENTS, MATERIALS, SUPPLIES]
- 1.2. you inspect valve train components.
- 1.3. you measure camshaft run out, journal wear, valve spring height, and valve stem height.
- 1.4. you inspect camshaft bearings.
- 1.5. you inspect camshaft drive components for wear and verify timing.
- 1.6. you complete the repair order.

#### **Learning Objectives**

- 1.a. Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine needed action.
- 1.b. 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.
- 1.c. Inspect valve springs for squareness and free height comparison; determine needed action.
- 1.d. Inspect valve guides for wear; check valve stem-to-guide clearance; determine needed action.
- 1.e. Inspect valves and valve seats; determine needed action.
- 1.f. Check valve spring assembled height and valve stem height; determine needed action.
- 1.g. Inspect valve lifters; determine needed action.
- 1.h. Inspect and/or measure camshaft for runout, journal wear and lobe wear.
- 1.i. Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine needed action.
- 1.j. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.

### **2. Repair cylinder head and valve train components.**

#### **Assessment Strategies**

- 2.1. Skill Demonstration
- 2.2. Written Product

#### **Criteria**

*You will know you are successful when:*

- 2.1. you remove, clean and inspect cylinder head including gasket.
- 2.2. you install cylinder head and gasket.
- 2.3. you verify engine timing and adjust valves.
- 2.4. you replace valve stem seals on an assembled engine and verify camshaft timing.

#### **Learning Objectives**

- 2.a. Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to

- manufacturer's specifications and procedures.
- 2.b. Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.
- 2.c. Adjust valves (mechanical or hydraulic lifters).
- 2.d. Verify engine mechanical timing.
- 2.e. Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine needed action.
- 2.f. Verify correct camshaft timing including engines equipped with variable valve timing systems (VVT).

### 3. Diagnose engine block concerns.

#### Assessment Strategies

- 3.1. Written Product
- 3.2. Skill Demonstration

#### Criteria

*You will know you are successful when:*

- 3.1. you select the correct [TOOLS, EQUIPMENT, INSTRUMENTS, MATERIALS, SUPPLIES]
- 3.2. you research vehicle service information.
- 3.3. you clean and inspect cylinder block and auxiliary shafts.
- 3.4. you inspect and measure cylinders, camshaft bearings, crankshaft, main bearings, connecting rods, connecting rod bearings, pistons, and rings.
- 3.5. you identify piston and bearing wear patterns.
- 3.6. you measure piston clearance.
- 3.7. you verify oil pressure.

#### Learning Objectives

- 3.a. Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine needed action.
- 3.b. Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine needed action.
- 3.c. Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine needed action.
- 3.d. 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.
- 3.e. Inspect main and connecting rod bearings for damage and wear; determine needed action.
- 3.f. Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine needed action.
- 3.g. Inspect and measure piston skirts and ring lands; determine needed action.
- 3.h. Determine piston-to-bore clearance.
- 3.i. Inspect, measure, and install piston rings.
- 3.j. Inspect auxiliary shaft(s) (balance, intermediate, idler, counterbalance or silencer); inspect shaft(s) and support bearings for damage and wear; determine needed action; reinstall and time.
- 3.k. Research applicable vehicle and service information, such as internal engine operation, vehicle service history, service precautions, and technical service bulletins.
- 3.l. Perform oil pressure tests; determine needed action.

### 4. Repair engine block components.

#### Assessment Strategies

- 4.1. Written Product
- 4.2. Skill Demonstration

#### Criteria

*You will know you are successful when:*

- 4.1. you remove, inspect and clean vibration damper and oil pump.
- 4.2. you disassemble, clean and reassemble engine block.
- 4.3. you deglaze cylinder walls.
- 4.4. you install covers using proper sealing techniques.

#### Learning Objectives

- 4.a. Remove, inspect, or replace crankshaft vibration damper (harmonic balancer).

- 4.b. Disassemble engine block; clean and prepare components for inspection and reassembly.
- 4.c. Deglaze and clean cylinder walls.
- 4.d. Assemble engine block.
- 4.e. Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform needed action.
- 4.f. Install engine covers using gaskets, seals, and sealers as required.