



Western Technical College

32404353 Engine Repair

Course Outcome Summary

Course Information

Description	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.
Career Cluster	Transportation, Distribution and Logistics
Instructional Level	Technical Diploma Courses
Total Credits	3
Total Hours	108

Pre/Corequisites

Prerequisite	32404357 Drive Systems 1
Prerequisite	32404386 Intro to Hybrid & Alt Fuel Vehicles
Prerequisite	32404382 Automotive Climate Control

Textbooks

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

Learner Supplies

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

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

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

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

Program Outcomes

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