Manitoba Grade 11A Automotive Technology Engine Fundamentals and Service (Course Code 8697)
Course Outline

Course Description

This course develops students' understanding of internal combustion engines and the interaction of their components. Students study engine classifications, operating cycles, valvetrains, timing systems, and service materials while practising inspection, repair, and replacement procedures. Trade mathematics supports accurate measurement and calculations of engine displacement, compression ratio, horsepower, area, and volume.

Course Objectives

- Apply safe work practices during engine service.
- Explain two-stroke, four-stroke, and rotary engine operation.
- Compare engine classifications and configurations.
- Identify engine and valvetrain components and explain their operation.
- Use service information and engine measuring tools.
- Calculate engine dimensions and operating parameters.
- Select and install appropriate fasteners, gaskets, seals, and sealants.
- Perform supervised engine component repairs.
- Document work and verify results against specifications.
- Demonstrate professional conduct and environmental responsibility.

Course Units

Unit hours are suggested planning allocations totalling 110 hours, including assessment and project work. Adjust to the school timetable. Safety, communication, mathematics, and environmental responsibility are reinforced throughout.

Unit 1: Engine Shop Safety and Work Practices

Estimated Time: 10 hours

Topics:

- PPE selection and safe work procedures
- Hazard identification, injury prevention, and emergency response
- Safe tool use, vehicle support, and housekeeping
- WHMIS, materials handling, and waste management
- Respectful communication and reporting unsafe conditions

Assessment: Safety review; practical safety demonstrations

Unit 2: Engine Principles and Classifications

Estimated Time: 14 hours

Topics:

- Two-stroke, four-stroke, and rotary operation
- Gasoline, diesel, and alternative-fuel engines
- Inline, opposed, V-type, W-type, and rotary configurations
- Component interaction and engine applications
- Career pathways and changing engine technology

Assessment: Engine theory test; operating-cycle explanation

Unit 3: Engine Measurement and Mathematics

Estimated Time: 16 hours

Topics:

- Metric and imperial dimensions and tolerances
- Fractions, decimals, percentages, and conversions
- Circumference, area, and volume calculations
- Ratios, proportions, and compression ratio
- Engine displacement and horsepower calculations

Assessment: Measurement lab; engine calculation assignment

Unit 4: Block and Cylinder Head Assemblies

Estimated Time: 18 hours

Topics:

- Block and cylinder head components
- Component design, purpose, and operation
- Inspection and comparison with service specifications
- Tool selection, care, and measurement accuracy
- Supervised component removal and replacement

Assessment: Component identification; inspection report; practical evaluation

Unit 5: Valvetrain and Timing Systems

Estimated Time: 18 hours

Topics:

- Pushrod, overhead-cam, and multi-valve designs
- Solenoid-operated valve concepts
- Timing gears, belts, and chains
- Variable valve timing
- Supervised service and replacement procedures

Assessment: Valvetrain lab; timing-system practical check

Unit 6: Fasteners, Gaskets, Seals, and Sealants

Estimated Time: 10 hours

Topics:

- Head bolts and main-bearing fasteners
- Gaskets, crankshaft seals, and valve-stem seals
- Sealant selection and compatibility
- Manufacturer tightening and installation specifications
- Resource stewardship, waste handling, and Indigenous perspectives

Assessment: Materials selection assignment; installation demonstration

Unit 7: Engine Service and Repair

Estimated Time: 16 hours

Topics:

- Service information and repair planning
- Safe component disassembly and organization
- Inspection and evidence-based repair decisions
- Approved repair, replacement, and reassembly
- Quality checks and professional documentation

Assessment: Engine service lab; repair record

Unit 8: Engine Service Project

Estimated Time: 8 hours

Topics:

- Selecting a teacher-approved engine task
- Recording dimensions and specifications
- Completing and verifying component service
- Explaining the repair and environmental considerations
- Communicating results and reflecting on work habits

Assessment: Engine project; service report

Assessment Breakdown

The weighting follows the supplied course-outline template; project tasks are adapted to this course.

Component	Weight
Theory Tests & Quizzes	25%
Practical Shop Skills	35%
Labs & Assignments	20%
Culminating Project	10%
Employability & Safety Practices	10%

Required Tools and Equipment

- Automotive hand tools and torque wrenches
- Engine stands and approved lifting equipment
- Micrometers, calipers, bore gauges, and straightedge
- Feeler gauges and dial indicator
- Engine and valvetrain service tools
- Engine trainers or suitable engine assemblies
- Manufacturer service information and specifications
- PPE and fluid collection equipment

Employability Skills

- Workplace safety and responsible decision-making
- Problem-solving, critical thinking, and creativity
- Clear communication, active listening, and teamwork
- Time management, organization, and independent learning
- Professional conduct, inclusion, and respect for others
- Environmental responsibility and global citizenship
- Career awareness within the automotive service industry

Culminating Project

Students will inspect and service a teacher-approved engine assembly or component. They will identify its function, take and record measurements, compare findings with manufacturer specifications, calculate relevant engine parameters, complete approved repairs or replacement, and verify assembly. A service report will explain the work and results.

Recommended Prerequisite

Grade 10 Automotive Systems and Service or equivalent introductory automotive experience. This is a suggested preparation pathway, not a provincial prerequisite stated in the supplied curriculum.

Curriculum Reference

Based on Manitoba's Grade 11A Engine Fundamentals and Service curriculum (Course Code 8697; supplied auto_gr11A_eng.pdf).

Curriculum alignment: A5 Trade Related Mathematics and A7 Engine Fundamentals, supported by safety, careers, communications, tools, and materials outcomes.