Manitoba Grade 12B Automotive Technology Advanced Mechanical Systems (Course Code 8701) Course Outline

Course Description

This course builds on foundational automotive courses to develop more advanced understanding and service skills across mechanical systems. Students examine the interaction of driveline, engine, steering, suspension, and non-ABS braking components, as well as body components, accessories, and trim. Accurate measurements, calculations, service information, and supervised repair procedures support diagnosis and repair decisions.

Course Objectives

- Apply safe work practices across mechanical service tasks.
- Explain the interaction of mechanical vehicle systems.
- Inspect and service driveshaft and axle components.
- Explain and service engine and valvetrain components.
- Use engine calculations and precise measurements.
- Service steering and suspension systems.
- Inspect and repair non-ABS braking systems.
- Repair or replace body components, accessories, and trim.
- Select materials and justify repair decisions using specifications.
- Verify work and communicate findings professionally.

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: Advanced Shop Practice and Repair Planning

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
- Service records, career development, and repair planning

Assessment: Safety demonstration; repair-plan assignment

Unit 2: Mechanical Measurement and Engine Calculations

Estimated Time: 12 hours

Topics:

- Precision measurement and tolerances
- Metric and imperial dimensions and conversions
- Fractions, percentages, ratios, and proportions
- Area, circumference, and volume
- Displacement, compression ratio, and horsepower calculations

Assessment: Measurement lab; calculation assignment

Unit 3: Driveshaft and Axle Service

Estimated Time: 16 hours

Topics:

- Driveshaft, CV-shaft, and axle configurations
- Joints, bearings, couplings, and supporting components
- Inspection tools and manufacturer specifications
- Lubricants, seals, gaskets, and fasteners
- Repair and replacement with verification

Assessment: Driveline service lab; inspection report

Unit 4: Engine and Valvetrain Service

Estimated Time: 20 hours

Topics:

- Combustion cycles and engine configurations
- Block, cylinder head, and valvetrain assemblies
- Timing gears, belts, chains, and variable valve timing
- Component condition and service decisions
- Engine repair, replacement, and assembly checks

Assessment: Engine practical; technical explanation

Unit 5: Steering and Suspension Service

Estimated Time: 18 hours

Topics:

- Frames and body construction
- Steering and suspension operation and interaction
- Inspection and measurement against specifications
- Safe component repair and replacement
- Fluids, lines, seals, and fasteners

Assessment: Chassis practical; service record

Unit 6: Non-ABS Braking Systems

Estimated Time: 18 hours

Topics:

- Hydraulic principles, friction, and kinetic energy
- Disc, drum, parking-brake, and power-assist systems
- Inspection and component measurements
- Brake fluids, fittings, flares, tubing, and hoses
- Approved repairs and post-service checks

Assessment: Brake practical; measurement and repair report

Unit 7: Body Components, Accessories, and Trim

Estimated Time: 8 hours

Topics:

- Locks, latches, windows, and body accessories
- Interior and exterior trim
- Trim tools, clips, fasteners, and damage prevention
- Repair and replacement procedures
- Material disposal and Indigenous sustainability perspectives

Assessment: Body-component practical; materials reflection

Unit 8: Integrated Mechanical Service Project

Estimated Time: 8 hours

Topics:

- Selecting and investigating a mechanical concern
- Using evidence and specifications to plan repairs
- Completing approved service work
- Checking related systems and verifying results
- Documenting recommendations and communicating findings

Assessment: Mechanical project; final 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

- PPE, service information, and technical specifications
- Approved vehicle and engine lifting equipment
- Hand tools, torque tools, and precision measuring equipment
- Engine and valvetrain service tools
- Driveshaft and axle service equipment
- Steering, suspension, and approved spring-service tools
- Brake measuring, bleeding, tubing, and flaring equipment
- Body and trim removal tools

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 complete an integrated mechanical service project on a teacher-approved vehicle or trainer. They will investigate a concern, gather measurements, identify related system effects, justify a repair plan, complete approved repairs, and verify the result. The final report will include specifications, calculations where relevant, work completed, and recommendations.

Recommended Prerequisite

Grade 11 Engine Fundamentals and Service, Chassis Fundamentals and Service, and Drivetrain Fundamentals and Service, or equivalent preparation. This is a suggested preparation pathway, not a provincial prerequisite stated in the supplied curriculum.

Curriculum Reference

Based on Manitoba's Grade 12B Advanced Mechanical Systems curriculum (Course Code 8701; supplied auto_gr12B_eng.pdf).

Curriculum alignment: A6 Driveline Systems I; A7 Engine Fundamentals; A10 Steering and Suspension Systems I; A11 Braking Systems I (Non-ABS); A13 Body Components, Accessories and Trim.