

SENIOR YEARS

Power Mechanics Technology



Fundamental Skills

General Learning Outcome

GLO F1 **Technical Communication:** Communicate technical ideas and designs effectively and appropriately.



Grade 9 Specific Learning Outcome(s)	Grade 10 Specific Learning Outcome(s)	Grade 11 Specific Learning Outcome(s)	Grade 12 Specific Learning Outcome(s)
IA9.F1.1 Use several presentation programs using existing formats to digitally communicate a technical idea.	IA10.F1.1 Design a simple presentation using a presentation program to communicate a technical idea.	IA11.F1.1 Apply an advanced presentation program effectively to communicate a technical idea visually.	IA12.F1.1 Apply an appropriate combination of digital, graphic, oral, and written techniques to effectively communicate a technical idea.
IA9.F1.2 Interpret a graphic presentation of a technical idea.	IA10.F1.2 Adapt a graphic presentation of a technical idea.	IA11.F1.2 Create a graphic presentation of a technical idea.	
IA9.F1.3 Recognize technical language and terms.	IA10.F1.3 Use technical language and terms in the correct context.	IA11.F1.3 Create a set of steps using correct technical writing techniques to effectively describe a technical process.	
IA9.F1.4 Effectively use technical reading skills to follow a set of instructional steps.	IA10.F1.4 Adapt a set of instructional steps using appropriate technical writing skills.		

Fundamental Skills



General Learning Outcome

GLO F2 **Problem Solving:** Apply effective decision-making, problem-solving, and design strategies to a project. (Refer to Appendix B for a sample design/problem-solving process.)

Grade 9 Specific Learning Outcome(s)	Grade 10 Specific Learning Outcome(s)	Grade 11 Specific Learning Outcome(s)	Grade 12 Specific Learning Outcome(s)
IA9.F2.1 Demonstrate an understanding of the problem-solving process in designing and producing a product.	IA10.F2.1 Identify problems and apply appropriate problem-solving skills to solve them.	IA11.F2.1 Transfer problem-solving skills to real-life situations.	IA12.F2.1 Research and articulate a problem that can be solved through technological means.
IA9.F2.2 Identify criteria for making and evaluating choices.	IA10.F2.2 Apply a decision-making strategy to practical situations.	IA11.F2.2 Use a variety of critical thinking skills to evaluate situations and make decisions.	IA12.F2.2 Apply problem-solving and design skills to develop a technological solution to a problem.
IA9.F2.3 Demonstrate an understanding of the qualities of good design.	IA10.F2.3 Modify an existing design to meet specified criteria.	IA11.F2.3 Create a design to meet a set of specifications.	IA12.F2.3 Analyze critically and act logically to evaluate situations and make decisions.

Fundamental Skills

General Learning Outcome

GLO F3 **Information Management:** Effectively manage information.



Grade 9 Specific Learning Outcome(s)	Grade 10 Specific Learning Outcome(s)	Grade 11 Specific Learning Outcome(s)	Grade 12 Specific Learning Outcome(s)
IA9.F3.1 Acquire and organize information using appropriate technology and information systems.	IA10.F3.1 Apply specialized information and skills in real-life situations.	IA11.F3.1 Transfer and apply specialized information and skills in a variety of situations.	IA12.F3.1 Acquire, analyze, and apply specialized information and skills from various disciplines in a variety of realistic circumstances.
IA9.F3.2 Demonstrate the appropriate use of information as directed.	IA10.F3.2 Access and use a range of relevant information, material, and human resources with limited direction.	IA11.F3.2 Acquire and use a range of relevant information, material, and human resources, and recognize when additional resources are required.	IA12.F3.2 Support and enhance basic information requirements by using a wide variety of information, material, and human resources.

Personal Skills



General Learning Outcome

GLO P1 **Time Management:** Demonstrate responsibility in time management, task completion, and in meeting project criteria. (Note: based on the Conference Board of Canada's Personal Management Skills)

Grade 9 Specific Learning Outcome(s)	Grade 10 Specific Learning Outcome(s)	Grade 11 Specific Learning Outcome(s)	Grade 12 Specific Learning Outcome(s)
IA9.P1.1 Demonstrate responsibility in time management.	IA10.P1.1 Demonstrate responsibility in time management.	IA11.P1.1 Demonstrate responsibility in time management.	IA12.P1.1 Demonstrate responsibility in time management.
IA9.P1.2 Demonstrate responsibility in being accountable for one's actions.	IA10.P1.2 Demonstrate responsibility in being accountable for one's actions.	IA11.P1.2 Demonstrate responsibility in being accountable for one's actions.	IA12.P1.2 Demonstrate responsibility in being accountable for one's actions.
IA9.P1.3 Arrive at class prepared with materials and completed assignments.	IA10.P1.3 Arrive at class prepared with materials and completed assignments.	IA11.P1.3 Arrive at class prepared with materials and completed assignments.	IA12.P1.3 Arrive at class prepared with materials and completed assignments.
IA9.P1.4 Complete all assigned tasks within stated deadlines.	IA10.P1.4 Complete all assigned tasks within stated deadlines.	IA11.P1.4 Complete all assigned tasks within stated deadlines.	IA12.P1.4 Complete all assigned tasks within stated deadlines.
IA9.P1.5 Complete all projects according to specified criteria.	IA10.P1.5 Complete all projects according to specified criteria.	IA11.P1.5 Complete all projects according to specified criteria.	IA12.P1.5 Complete all projects according to specified criteria.

Personal Skills

General Learning Outcome

GLO P2 **Ethical Decision Making:** Make ethical decisions concerning the impact of one’s activities and the use of technology.



Grade 9 Specific Learning Outcome(s)	Grade 10 Specific Learning Outcome(s)	Grade 11 Specific Learning Outcome(s)	Grade 12 Specific Learning Outcome(s)
<p>IA9.P2.1 Make personal judgments whether certain behaviours/actions are right or wrong.</p> <p>IA9.P2.2 Demonstrate an understanding of technological impact on the environment, society, lifestyles, etc.</p>	<p>IA10.P2.1 Assess how personal judgments affect peer members and/or community members.</p> <p>IA10.P2.2 Demonstrate an understanding of the impact of technological choices.</p>	<p>IA11.P2.1 Assess the implications of personal/group actions within the broader community.</p> <p>IA11.P2.2 Develop and implement risk-management strategies for a variety of technological activities.</p>	<p>IA12.P2.1 Analyze the implications of personal/group actions within the global context.</p> <p>IA12.P2.2 State and support a personal code of ethics as required.</p> <p>IA12.P2.3 Demonstrate responsible leadership in managing current and future technologies on the environment and on society.</p>

Personal Skills



General Learning Outcome

GLO P3 **Career Planning:** Develop an action plan relating personal aptitudes and abilities to occupational opportunities.

Grade 9 Specific Learning Outcome(s)	Grade 10 Specific Learning Outcome(s)	Grade 11 Specific Learning Outcome(s)	Grade 12 Specific Learning Outcome(s)
IA9.P3.1 Identify critical skills needed for employability in today's workplace.	IA10.P3.1 Evaluate employability profiles for a variety of workplaces and careers.	IA11.P3.1 Develop strategies to assess personal technological literacy and capability.	IA12.P3.1 Assess specific personal skills, interests, and abilities (career portfolio).
IA9.P3.2 Demonstrate an awareness of the technologies of specific occupations and workplaces.	IA10.P3.2 Outline skills required for a specific career path.	IA11.P3.2 Perform an assessment of personal strengths and weaknesses (career portfolio).	IA12.P3.2 Develop a plan for acquiring the technological capabilities required to achieve a career vision (career portfolio).

Personal Skills

General Learning Outcome

GLO P4 **Safe Practices:** Demonstrate safe practices with tools, machines, materials, and related processes. (Refer to: Keeping Your Facilities SAFE: A Support Document for Industrial Arts Teachers, Manitoba Education and Youth, 2003.)



Grade 9 Specific Learning Outcome(s)	Grade 10 Specific Learning Outcome(s)	Grade 11 Specific Learning Outcome(s)	Grade 12 Specific Learning Outcome(s)
IA9.P4.1 Follow personal and environmental health and safety procedures.	IA10.P4.1 Recognize and follow personal and environmental health and safety procedures.	IA11.P4.1 Establish and follow personal and environmental health and safety procedures.	IA12.P4.1 Transfer and apply personal and environmental health and safety procedures to a variety of environments and situations.
IA9.P4.2 Identify immediate hazards and their impact on self, others, and the environment.	IA10.P4.2 Identify immediate and potential hazards and their impact on self, others, and the environment.	IA11.P4.2 Identify immediate and potential hazards and assess their impact on self, others, and the environment.	IA12.P4.2 Identify immediate and potential hazards and assess their impact on self, others, and the environment, and recommend safe procedures.
IA9.P4.3 Identify and follow appropriate emergency response procedures.	IA10.P4.3 Identify and follow appropriate emergency response procedures.	IA11.P4.3 Identify and follow appropriate emergency response procedures.	IA12.P4.3 Identify and follow appropriate emergency response procedures.

Personal Skills



General Learning Outcome

GLO P5 **Positive Attitude:** Demonstrate positive attitudes to learning in Industrial Arts facilities.

Grade 9 Specific Learning Outcome(s)	Grade 10 Specific Learning Outcome(s)	Grade 11 Specific Learning Outcome(s)	Grade 12 Specific Learning Outcome(s)
IA9.P5.1 Listen, in order to understand and learn.	IA10.P5.1 Listen and respond, in order to understand and learn.	IA11.P5.1 Listen and respond, in order to understand, learn and teach.	IA12.P5.1 Listen and respond, in order to understand, learn, teach, and evaluate.
IA9.P5.2 Demonstrate a willingness to continuously learn.	IA10.P5.2 Assess personal learning needs (i.e., personal learning style).	IA11.P5.2 Identify learning sources and opportunities.	IA12.P5.2 Set learning goals and develop a personal learning plan.
IA9.P5.3 Actively participate in a positive manner.	IA10.P5.3 Actively participate in a positive manner.	IA11.P5.3 Actively participate in a positive manner.	IA12.P5.3 Actively participate in a positive manner.

Personal Skills

General Learning Outcome

GLO P6 **Teamwork:** Adapt strategies to work effectively, independently, or as a team member to complete a project.



Grade 9 Specific Learning Outcome(s)	Grade 10 Specific Learning Outcome(s)	Grade 11 Specific Learning Outcome(s)	Grade 12 Specific Learning Outcome(s)
IA9.P6.1 Demonstrate an understanding of the role of members of a team.	IA10.P6.1 Contribute to a team to achieve its mandate.	IA11.P6.1 Identify the need to lead and/or support in a team situation, in order to achieve the team mandate.	IA12.P6.1 Understand and work with others on a "job" to achieve the best results.
IA9.P6.2 Acknowledge the opinions and contributions of all team members.	IA10.P6.2 Respect the opinions and contributions of all team members.	IA11.P6.2 Seek and appreciate the opinions and contributions of all team members.	IA12.P6.2 Lead and/or support as appropriate to motivate a team for high performance.
IA9.P6.3 List and define team objectives.	IA10.P6.3 Contribute to the development of team objectives and goals.		IA12.P6.3 Develop and/or refine a team approach based on needs and benefits.

Production Skills



General Learning Outcome

GLO PM1 **Energy Conversion:** Demonstrate an understanding of the theory of internal combustion and alternate energy converters.

Grade 9 Specific Learning Outcome(s)	Grade 10 Specific Learning Outcome(s)	Grade 11 Specific Learning Outcome(s)	Grade 12 Specific Learning Outcome(s)
IA9.PM1.1 Identify several methods of converting fuel to mechanical energy such as internal combustion, hydrogen fuel cell, diesel engines (glow plug .049 model)...	IA10.PM1.1 →	IA11.PM1.1 →	IA12.PM1.1 Explain and demonstrate the principles behind several methods of converting fuel to mechanical energy.
IA9.PM1.2 Identify several types and applications of internal combustion engines such as two-stroke, four-stroke, rotary, diesel, K-cycle...	IA10.PM1.2 →	IA11.PM1.2 →	IA12.PM1.2 Explain and demonstrate in detail the operation and cycles of most types of internal combustion engines.
IA9.PM1.3 Identify the basic parts of several types of internal combustion engines.	IA10.PM1.3 →	IA11.PM1.3 →	IA12.PM1.3 Disassemble, identify, and explain the operation of the basic parts of most internal combustion engines.

Production Skills

General Learning Outcome

GLO PM2 **Engine Systems:** Identify and analyze various engine systems.



Grade 9 Specific Learning Outcome(s)	Grade 10 Specific Learning Outcome(s)	Grade 11 Specific Learning Outcome(s)	Grade 12 Specific Learning Outcome(s)
IA9.PM2.1 Identify the parts of the fuel and engine management system in an internal combustion engine such as the fuel injector, throttle, fuel pressure regulator, idle air control valve...	IA10.PM2.1 →	IA11.PM2.1 →	IA12.PM2.1 Identify, explain the operation and function of, and adjust/repair (when possible) the parts of the fuel management system in an internal combustion engine.
IA9.PM2.2 Identify the parts of the filtering system in an internal combustion engine such as the engine air filter, oil filter, automatic transmission filter...	IA10.PM2.2 →	IA11.PM2.2 →	IA12.PM2.2 Identify, explain the operation of and clean/replace the parts of the filtering system of an internal combustion engine.
IA9.PM2.3 Identify the parts of the cooling system in an internal combustion engine such as the radiator, fan, shroud, water pump...	IA10.PM2.3 →	IA11.PM2.3 →	IA12.PM2.3 Identify, explain, and adjust/repair (when possible) the parts of the cooling system of an internal combustion engine.
IA9.PM2.4 Identify the parts of the exhaust and emissions system of an internal combustion engine such as the EGR valve, catalytic converter, muffler...	IA10.PM2.4 →	IA11.PM2.4 →	IA12.PM2.4 Identify, explain, and adjust/repair (when possible) the parts of the exhaust and emissions system of an internal combustion engine.

Production Skills



General Learning Outcome

GLO PM3 **Electrical Systems:** Understand the basic electrical principles applied to power mechanics systems.

Grade 9 Specific Learning Outcome(s)	Grade 10 Specific Learning Outcome(s)	Grade 11 Specific Learning Outcome(s)	Grade 12 Specific Learning Outcome(s)
IA9.PM3.1 Identify the parts of the wiring system in an internal combustion engine such as the circuit protection devices, wire harness...	IA10.PM3.1 →	IA11.PM3.1 →	IA12.PM3.1 Identify, explain the operation and function of, and adjust/repair (when possible) the parts of the wiring system in an internal combustion engine.
IA9.PM3.2 Identify the parts of the starting system in an internal combustion engine such as the starter motor, starter solenoid...	IA10.PM3.2 →	IA11.PM3.2 →	IA12.PM3.2 Identify, explain the operation and function of, and adjust/repair (when possible) the parts of the starting system in an internal combustion engine.
IA9.PM3.3 Identify the parts of the charging system in an internal combustion engine such as the alternator, battery...	IA10.PM3.3 →	IA11.PM3.3 →	IA12.PM3.3 Identify, explain the operation and function of, and adjust/repair (when possible) the parts of the charging system in an internal combustion engine.

Production Skills

General Learning Outcome

GLO PM4 **Mechanical Systems:** Identify and analyze the mechanical systems of an internal combustion engine.



Grade 9 Specific Learning Outcome(s)	Grade 10 Specific Learning Outcome(s)	Grade 11 Specific Learning Outcome(s)	Grade 12 Specific Learning Outcome(s)
IA9.PM4.1 Identify the parts of the transmission system in an internal combustion engine such as the torque converter, input shaft, planetary gear sets...	IA10.PM4.1 →	IA11.PM4.1 →	IA12.PM4.1 Identify, explain the operation and function of, and adjust/repair (when possible) the parts of the transmission system in an internal combustion engine.
IA9.PM4.2 Identify the parts of the power train system in an internal combustion engine such as the camshaft, driveshaft, differential, PCM module...	IA10.PM4.2 →	IA11.PM4.2 →	IA12.PM4.2 Identify, explain the operation and function of, and adjust/repair (when possible) the parts of the power train system in an internal combustion engine.

Production Skills



General Learning Outcome

GLO PM5 **Chassis Systems:** Identify and compare various automotive chassis systems.

Grade 9 Specific Learning Outcome(s)	Grade 10 Specific Learning Outcome(s)	Grade 11 Specific Learning Outcome(s)	Grade 12 Specific Learning Outcome(s)
IA9.PM5.1 Identify the parts of the brake system of an automobile such as the brake drums, brake lines, master cylinder, ABS modulator...	IA10.PM5.1 →	IA11.PM5.1 →	IA12.PM5.1 Identify, explain the operation and function of, and adjust/repair (when possible) the parts of the brake system in an automobile.
IA9.PM5.2 Identify the parts of the ride and handling system of an automobile such as the shock absorbers, stabilizer bar, Macpherson struts...	IA10.PM5.2 →	IA11.PM5.2 →	IA12.PM5.2 Identify, explain the operation and function of, and adjust/repair (when possible) the parts of the ride and handling system in an automobile.
IA9.PM5.3 Identify the parts of the steering system of an automobile such as the power-steering pump, tie-rod ends, pitman arm...	IA10.PM5.3 →	IA11.PM5.3 →	IA12.PM5.3 Identify, explain the operation and function of, and adjust/repair (when possible) the parts of the steering system in an automobile.

Production Skills

General Learning Outcome

GLO PM6 **Climate Control Systems:** Identify and analyze the climate control systems in an automobile.



Grade 9 Specific Learning Outcome(s)	Grade 10 Specific Learning Outcome(s)	Grade 11 Specific Learning Outcome(s)	Grade 12 Specific Learning Outcome(s)
IA9.PM6.1 Identify the parts of the heating system of an automobile such as the heater core, blower motor, hoses...	IA10.PM6.1 →	IA11.PM6.1 →	IA12.PM6.1 Identify, explain the operation and function of, and adjust/repair (when possible) the parts of the heating system in an automobile.
IA9.PM6.2 Identify the parts of the air-conditioning system of an automobile such as the condenser, compressor, evaporator...	IA10.PM6.2 →	IA11.PM6.2 →	IA12.PM6.2 Identify, explain the operation and function of, and adjust/repair (when possible) the parts of the air-conditioning system in an automobile.

Production Skills



General Learning Outcome

GLO PM7 **Assembly/Disassembly Tools:** Demonstrate the use of tools and equipment in assembly and disassembly of mechanical components.

Grade 9 Specific Learning Outcome(s)	Grade 10 Specific Learning Outcome(s)	Grade 11 Specific Learning Outcome(s)	Grade 12 Specific Learning Outcome(s)
IA9.PM7.1 Identify and use tools common to power mechanics such as hand tools, power tools, hoists, jacks...	IA10.PM7.1 →	IA11.PM7.1 →	IA12.PM7.1 Determine and apply the appropriate tool for a given power mechanics task.
IA9.PM7.2 Identify and use common reconditioning tools used in power mechanics such as lathes, wire wheels, seat grinde...	IA10.PM7.2 →	IA11.PM7.2 →	IA12.PM7.2 Determine and apply the appropriate tool for a given engine reconditioning task.
IA9.PM7.3 Identify common fasteners used on automobiles such as bolts, rivets, pins...	IA10.PM7.3 →	IA11.PM7.3 →	IA12.PM7.3 Determine and apply the appropriate fastener for a given task.
IA9.PM7.4 Identify tools and materials used with seals in automobiles such as gasket rubber, gasket felt, silicon seal, glues...	IA10.PM7.4 →	IA11.PM7.4 →	IA12.PM7.4 Determine and apply the appropriate seal, gasket, and/or adhesive for a given sealing task.
IA9.PM7.5 Identify the manuals and manual systems used in automobile repair.	IA10.PM7.5 →	IA11.PM7.5 →	IA12.PM7.5 Use an automotive manual to obtain repair information.

Production Skills

General Learning Outcome

GLO PM8 **Diagnostic Tools:** Use diagnostic tools and methods to troubleshoot, diagnose, and repair power mechanical systems.



Grade 9 Specific Learning Outcome(s)	Grade 10 Specific Learning Outcome(s)	Grade 11 Specific Learning Outcome(s)	Grade 12 Specific Learning Outcome(s)
IA9.PM8.1 Identify common automotive diagnostic tools such as ignition testers, charging system analyzers, scopes, scanners...	IA10.PM8.1 →	IA11.PM8.1 →	IA12.PM8.1 Use appropriate diagnostic tools and problem-solving methods to analyze and repair automotive issues.
IA9.PM8.2 Explain common automotive diagnostic techniques such as the spark test, compression test, fuel delivery test, ignition timing...	IA10.PM8.2 →	IA11.PM8.2 →	IA12.PM8.2 Use appropriate diagnostic techniques and problem-solving methods to analyze and repair automotive issues.

Production Skills



General Learning Outcome

GLO PM9 **Environmental Impact and Current Innovations:** Demonstrate an understanding of current innovation in automotive industry, environmental impacts, and emerging new technologies.

Grade 9 Specific Learning Outcome(s)	Grade 10 Specific Learning Outcome(s)	Grade 11 Specific Learning Outcome(s)	Grade 12 Specific Learning Outcome(s)
IA9.PM9.1 Identify several current innovations in the automotive industry such as continuously variable transmissions, advanced suspension systems, modular vehicle assembly, use of new materials...	IA10.PM9.1 →	IA11.PM9.1 →	IA12.PM9.1 Research, explain, and demonstrate several current innovations in the automotive industry.
IA9.PM9.2 Identify several current issues and innovations regarding the automotive industry and environmental impact such as emission issues, energy consumption, sustainable development...	IA10.PM9.2 →	IA11.PM9.2 →	IA12.PM9.2 Research, explain, and demonstrate several current issues and innovations regarding the automotive industry and environmental impact.