**Area of Learning: Applied Design, Skills, and Technologies —   
Engine and Drivetrain Grade 12**

**BIG IDEAS**

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| Vehicle operation, service, and maintenance include consideration of **social and environmental impacts**. |  | Personal service and maintenance interests require the evaluation and refinement of skills. |  | Tools and **technologies** can be adapted for specific purposes. |

**Learning Standards**

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| **Curricular Competencies** | **Content** |
| *Students are expected to be able to do the following:*  Applied Design   * Interpret circumstances of or factors in a particular engine challenge   Defining   * Identify potential issues and troubleshoot * Identify requirements, intended impacts, and possible unintended negative consequences  of service * Determine whether activity is collaborative or self-directed   Ideating   * Generate ideas to create a range of possibilities and add to others’ ideas in ways that create additional possibilities * Critically analyze how competing social, ethical, and sustainability considerations impact creation and development of solutions * Choose an idea to pursue and maintain an open mind about other potentially viable ideas   Prototyping   * Evaluate and apply appropriate sources of information to develop a plan that includes  key stages and resources * Analyze the **design for the life cycle** and evaluate its **impacts** * Make changes to tools, materials, and procedures as needed   Testing   * Identify and communicate with sources of feedback | *Students are expected to know the following:*   * engine design, repair, and maintenance * valve timing, operation, and adjustment * compression ratios * ignition timing and adjustment * intake and exhaust performance, enhancement, and fabrication * fuel systems * braking systems * automatic and manual transmissions * wheel size, specification, and function * suspension systems * relationship between performance enhancements and original equipment manufacturer (OEM) parts * engine-related **diagnostic equipment** * hybrid and alternative fuel vehicles * design for the life cycle * career options and opportunities  in engine design and repair * **interpersonal skills** for interacting  with clients and customers |

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**Learning Standards (continued)**

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| **Curricular Competencies** | **Content** |
| * Develop an **appropriate test**, conduct the test, and collect and compile data * Evaluate ideas based on information from feedback and testing results to make  necessary changes   Making   * Identify appropriate tools, technologies, materials, processes, and time needed * Carry out updated plan, incorporating feedback from self and others and from testing results * Use materials in ways that minimize waste   Sharing   * Decide how and with whom to **share** their processes, to solicit and generate feedback * Share final plans, products and processes to evaluate their success * Critically reflect on plans, products and processes, and identify new goals * Identify and analyze new possibilities for plans, products and processes, including how they or others might build on them   Applied Skills   * Apply safety procedures for themselves, co-workers, and operators in both physical  and digital environments * Individually or collaboratively identify and assess skills needed for automotive service plans, products and processes * Demonstrate competency and proficiency in skills at various levels involving manual dexterity and complex mechanics and maintenance * Develop specific plans to learn or refine identified skills over time   Applied Technologies   * Explore existing, new, and emerging tools, technologies, and systems to evaluate suitability for project interests * Evaluate impacts, including unintended negative consequences, of choices made about technology use * Analyze the role that advancing technologies play in engine-related contexts |  |

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| **APPLIED DESIGN, SKILLS, AND TECHNOLOGIES – Engine and Drivetrain  Big Ideas – Elaborations Grade 12** |
| * **social and environmental impacts:** including operator and public safety; emissions and effects on the environment; manufacturing, packaging, disposal, and recycling considerations related to vehicle parts and products * **technologies:** tools that extend human capabilities |

| **APPLIED DESIGN, SKILLS, AND TECHNOLOGIES – Engine and Drivetrain  Curricular Competencies – Elaborations Grade 12** |
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| * **design for the life cycle:** taking into account economic costs, and social and environmental impacts of the product, from the extraction  of raw materials to eventual reuse or recycling of component materials * **impacts:** including the social and environmental impacts of extraction and transportation of raw materials; manufacturing, packaging,  and transportation to markets; servicing or providing replacement parts; expected usable lifetime: and reuse or recycling of component materials * **appropriate test:** includes evaluating the degree of authenticity required for the setting of the test, deciding on an appropriate type and number  of trials, and collecting and compiling data * **share:** may include showing to others or use by others, giving away, or marketing and selling |

| **APPLIED DESIGN, SKILLS, AND TECHNOLOGIES – Engine and Drivetrain  Content – Elaborations Grade 12** |
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| * **diagnostic equipment:** for example, scanners, on-board diagnostics (OBD), timing lights * **interpersonal skills:** for example, professional communications, active listening to identify potential problems, courtesies |