**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
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|  **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
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|  **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
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