**Area of Learning: Applied Design, Skills, and Technologies — Engineering Grade 11**

**BIG IDEAS**

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| **Design for the life cycle** includes consideration  of social and  **environmental impacts**. |  | Personal design  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  Understanding context   * Engage in a period of **user-centred research** and **empathetic observation**  to understand design opportunities   Defining   * Establish a point of view for a chosen design opportunity * Identify potential users, intended impacts, and possible unintended negative consequences * Make decisions about premises and **constraints** that define the design space,  and identify criteria for success * Determine whether activity is collaborative or self-directed   Ideating   * Critically analyze how competing social, ethical, and sustainability considerations impact creation and development of solutions * Generate ideas to create a range of possibilities and add to others’ ideas in ways that create additional possibilities * Choose an idea to pursue based on success criteria and maintain an open mind about potentially viable ideas | *Students are expected to know the following:*   * design for the life cycle * history of manufacturing and production * **product development** and **manufacturing processes** * manufacturing to meet the needs of the end user * **sustainable production**, upcycling, and **product life cycle** * **mathematics** in engineering projects * **measurement techniques** in engineering projects * **physics** in engineering projects * **static analysis** of structures * use of **hand tools** and **power tools** * **programming languages** for robotics and computer numerical control (CNC) * methods of implementing **computer control** * **technical communications** * approaches to **innovative engineering projects** * fundamentals of robotics and robotic manufacturing * **modelling** and **simulation** |

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**Learning Standards (continued)**

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| **Curricular Competencies** | **Content** |
| Prototyping   * Choose a form for prototyping and develop a **plan** that includes key stages  and resources * Analyze the design for the life cycle and evaluate its **impacts** * Visualize and construct prototypes, making changes to tools, materials, and procedures as needed * Record **iterations** of prototyping   Testing   * Identify and communicate with **sources of feedback** * Develop an **appropriate test** of the prototype, conduct the test, and collect  and compile data * Apply information from critiques, testing results, and success criteria to make changes   Making   * Identify appropriate tools, technologies, materials, processes, cost implications,  and time needed * Create design, incorporating feedback from self, others, and results from testing  of the prototype * Use materials in ways that minimize waste   Sharing   * Decide how and with whom to **share** creativity, or share and promote design  and processes * Share the product with users to evaluate its success * Critically reflect on plans, products and processes, and identify new design 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 users in both physical  and digital environments |  |

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**Learning Standards (continued)**

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| **Curricular Competencies** | **Content** |
| * Individually or collaboratively identify and assess skills needed for design interests * Demonstrate competency and proficiency in skills at various levels involving  manual dexterity * 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 design interests * Evaluate impacts, including unintended negative consequences, of choices made  about technology use * Examine the role that advancing technologies play in multiple engineering contexts |  |