**Area of Learning: Applied Design, Skills, and Technologies —
Electronics and Robotics Grade 10**

**BIG IDEAS**

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| User needs and interests drive the design process. |  | Social, ethical, and sustainability considerationsimpact design. |  | Complex tasks require the sequencing of skills. |

**Learning Standards**

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| **Curricular Competencies** | **Content** |
| *Students are expected to be able to do the following:*Applied DesignUnderstanding context* Engage in a period of researchand **empathetic observation**

Defining* Identify potential users and relevant contextual factors for a chosen design opportunity
* Identify criteria for success, intended impact, and any **constraints**
* Determine whether activity is collaborative or self-directed

Ideating* Take creative risks in generating ideas and add to others’ ideas in ways that enhance them
* Screen ideas against criteria and constraints
* Critically analyze and prioritize competing **factors** to meet community needs for preferred futures
* Maintain an open mind about potentially viable ideas

Prototyping* Choose a form for prototyping and develop a **plan** that includes key stages and resources
* Evaluate a variety of materials for effective use and potential for reuse, recycling, and biodegradability
 | *Students are expected to know the following:** design opportunities
* **Ohm’s law**
* **electrical theory** using parallel and series circuits
* breadboard circuitry
* production of simple circuits from schematic drawings
* electronicdiagnostic and testing **instruments**
* function and application of **components**
* construction sequences involved in making a **working circuit**
* function and use of **hand tools** and operation of **stationary equipment**
* **cases** for enclosing a circuit
* sequencesinvolved in making a functional robot
* robot **elements**
* block-based coding or logic-based programming for robotics
* programming platformsfor robotics
* flow charts related to robotics behaviour
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**Learning Standards (continued)**

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| **Curricular Competencies** | **Content** |
| * Prototype, making changes to tools, materials, and procedures as needed
* Record **iterations** of prototyping

Testing* Identify **sources of feedback**
* Develop an appropriate test
* Conduct the test, collect and compile data, evaluate data, and decide on changes

Making* Identify and use appropriate tools, **technologies**, materials, and processes
* Make a step-by-step plan and carry it out, making changes as needed
* Use materials in ways that minimize waste

Sharing* Decide on how and with whom to **share** **product** and processes
* Demonstrate product to users and critically evaluate its success
* Identify new design goals

Applied Skills* Demonstrate and document an awareness of precautionary and emergency safety procedures
* Develop competency and proficiency in skills at various levels involving manual dexterity and circuitry
* Identify the skills needed, individually or collaboratively, in relation to specific projects, and develop and refine them

Applied Technologies* Choose, adapt, and if necessary learn more about appropriate tools and technologies to use for tasks
* Evaluate **impacts**, including unintended negative consequences, of choices made about technology use
* Evaluate the influences of land, natural resources, and culture on the development and use of tools and technologies
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|  **APPLIED DESIGN, SKILLS, AND TECHNOLOGIES – Electronics and RoboticsCurricular Competencies – Elaborations Grade 10** |
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| * **empathetic observation:** may include experiences; traditional cultural knowledge and approaches of First Peoples and those of other cultures; places, including the land and its natural resources and analogous settings; people, including users, experts, and thought leaders
* **constraints:** limiting factors such as task or user requirements, materials, expense, environmental impact
* **factors:** including social, ethical, and sustainability
* **plan:** for example, pictorial drawings, sketches, flow charts
* **iterations:** repetitions of a process with the aim of approaching a desired result
* **sources of feedback:** may include First Nations, Métis, or Inuit community experts; keepers of other traditional cultural knowledge and approaches; peers, users, and other experts
* **technologies:** tools that extend human capabilities
* **share:** may include showing to others, use by others, giving away, or marketing and selling
* **product:** for example, a physical product, process, system, service, or designed environment
* **impacts:** personal, social, and environmental
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|  **APPLIED DESIGN, SKILLS, AND TECHNOLOGIES – Electronics and RoboticsContent – Elaborations Grade 10** |
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| * **Ohm’s law:** describes howvoltage, current, and resistance are related, as in V = IR
* **electrical theory:** for example, source, load, control, conductor, voltage, current, resistance, insulator, alternating current (AC), and direct current (DC)
* **instruments:** for example, multimeter, power supplies, test probes, signal-generating devices
* **components:** for example, light-emitting diode (LED), resistor, diode, light-dependent resistor (LDR), capacitor, voltage amplifiers, audio amplifiers, rectifiers
* **working circuit:** for example, current, amperage, load, resistance, power, control
* **hand tools:** for example,screwdriver, pliers, cutter, wire stripper, desoldering pump, snips, punch, soldering iron
* **stationary equipment:** for example, box and pan brake, bar folder, shears, punches, drill press, strip heater
* **cases:** for example, wood, 3D printed, metal, plastic
* **elements:** for example, input/output sensors, effectors, control systems, movement
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