BIG IDEAS

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

Learning Standards

Curricular Competencies	Content
Students are expected to be able to do the following:	*Students are expected to know the following:*
Applied Design ***Understanding context*** • Engage in a period of research and **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	• design opportunities • **Ohm's law** • **electrical theory** using parallel and series circuits • breadboard circuitry • production of simple circuits from schematic drawings • electronic diagnostic 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 • sequences involved in making a functional robot • robot **elements** • block-based coding or logic-based programming for robotics • programming platforms for robotics • flow charts related to robotics behaviour

Learning Standards (continued)

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	

Curricular Competencies – Elaborations

APPLIED DESIGN, SKILLS, AND TECHNOLOGIES – Electronics and Robotics
Grade 10

- **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

Content – Elaborations

APPLIED DESIGN, SKILLS, AND TECHNOLOGIES – Electronics and Robotics
Grade 10

- **Ohm's law:** describes how voltage, 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