Connections Engineering Outreach

Connections Engineering Outreach Program Catalogue

Connections Engineering Outreach is proud to offer the following catalogue of workshops that are linked to Ontario curriculum. We offer workshops for students in Kindergarten to grade eight across a variety of curriculum expectations. Our workshops have been developed at the introductory level, and are intended to engage students in hands-on engineering activities.

Tech 'n' Tinker Trailer Workshops:

These workshops are hosted *inside the Tech 'n' Tinker Trailer*, and are rooted in the engineering design process – design, build, test and improve. *All workshops for students in Kindergarten to grade 2 are 50 minute in duration, while workshops for students in grade 3 and above are 100 minutes in duration.*

Title	Description	Grade	Topics	Unit	Discipline
Air-Powered Car	Students will follow the engineering design cycle in order to construct an air-powered car.	1	Identify the materials that make up objects and structures; Describe the substances from which something is made **This workshop is hosted in the *classroom* for students in grade 1**	Understanding Structures and Mechanisms: Materials, Objects, and Everyday Structures	Mechanical Engineering
		2	Design, build and test a mechanism that includes simple machines	Understanding Mechanisms and Structures: Movement	
		3	Design, build and test a device that use force; investigate forces that cause an object to start/stop moving; investigate the effects of increasing/decreasing the amount of force applied to an object	Understanding Matter and Energy: Forces Causing Movement	

Rock Sheds	Using the engineering design process, students will construct a rock shed that will protect a train.	3	Assess the effects of the action of forces in nature on the natural and built environment; Assess the impact of safety devices that minimize the effects of forces	Understanding Matter and Energy: Forces Causing Movement	Geological/Civil Engineering
		4	Analyse the positive and negative impacts of human interactions with natural habitats and communities; evaluate ways of minimizing the negative impacts	Understanding Life Systems: Habitats and Communities	
		7	Evaluate the importance for individuals, the economy and the environment of factors that should be considered in designing and building structures and devices to meet specific needs	Understanding Structures and Mechanisms: Form and Function	
		8	Assess the social, economic, and environmental impacts of automating systems; use technological problem-solving skills to investigate a system that performs a function	Understanding Structures and Mechanisms: Systems in Action	
Tiny House	Students will design, build, test and improve a tiny house that is environmentally friendly.	4	Analyse the positive and negative impacts of human interactions with natural habitats and communities; evaluate ways of minimizing the negative impacts	Understanding Life Systems: Habitats and Communities	Civil Engineering
		5	Analyse the long-term impacts on society and the environment of human uses of energy and natural resources; build a device that transfers one form of energy into another	Understanding Earth and Space Systems: Conservation of Energy and Resources	
Solar Car	Students will use the engineering design process to construct a model car powered by a solar panel.	6	Assess the short- and long-term environmental effects of the different ways in which electricity is generated in Canada; assess opportunities for reducing electricity consumption	Understanding Matter and Energy: Electricity and Electrical Devices	Mechanical Engineering
		7	Assess the environmental and economic impacts of using conventional and alternative forms of energy	Understanding Earth and Space Systems: Heat in the Environment	
		8	Use technological problem-solving skills to investigate a system that performs a function; identify the various processes/components of a system that allow it to perform its function	Understanding Structures and Mechanisms: Systems in Action	

Micro:Fit	Students will code a variety of programs on micro:bits. Students will also use the engineering design process to construct a wearable device for their micro:bit.	5	Evaluate the effects, both beneficial and harmful, of various technologies on human body systems, taking different perspectives into account	Understanding Life Systems: Human Organ Systems	Computer Engineering
		6	Use technological problem-solving skills to design, build and test a device that transforms electrical energy into another form of energy to perform a function	Understanding Matter and Energy: Electricity and Electrical Devices	
		7	Evaluate the importance for individuals, society, the economy, and the environment of factors that should be considered in designing and building structures and devices to meet specific needs	Understanding Structures and Mechanisms: Form and Function	
		8	Use technological problem-solving skills to investigate a system that performs a function; identify the various processes/components of a system that allow it to perform its function	Understanding Structures and Mechanisms: Systems in Action	
Makey Makey Controller	Students will use the engineering design process to develop a videogame controller using the MakeyMakey and a variety of materials	5	Use scientific inquiry/experimentation skills to determine how the physical properties of materials make them useful for particular tasks	Understanding Matter and Energy: Properties of and Changes in Matter	Electrical Engineering
		6	Identify ways in which electrical energy is transformed into other forms of energy; explain the functions of the components of a simple electrical circuit	Understanding Matter and Energy: Electricity and Electrical Devices	
		7	Evaluate the importance for individuals, society, the economy, and the environment of factors that should be considered in designing and building structures and devices to meet specific needs	Understanding Structures and Mechanisms: Form and Function	
		8	Use technological problem-solving skills to investigate a system that performs a function; identify various types of systems	Understanding Structures and Mechanisms: Systems in Action	

Coding Canadarm2	Using Scratch, students will design a program that allows them to control the Canadarm2 and complete related tasks.	6	Assess the contributions of Canadians to the exploration and scientific understanding of space	Understanding Earth and Space Systems: Space	Computer Engineering
3D Design		7	Solve problems that require conversion between metric units of area	Measurement	Multi-Disciplinary Design Tool
		8	Assess the social, economic and environmental impacts of automating systems	Understanding Structures and Mechanisms: Systems in Action	
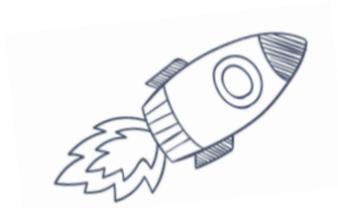
Robotics Workshops:

These workshops are hosted inside the school (i.e. learning commons, library, and classroom) and focus on computational thinking strategies. *All workshops for students in Kindergarten to grade 2 are 50 minute in duration, while workshops for students in grade 3 and above are 100 minutes in duration.*

Robot	Title	Grade	Description	Topic	Unit
Bee-Bot	Story Maps	Kindergarten	Students program their robots to navigate through a story map; stopping at key points in the story	Retell experiences, events, and familiar stories in proper sequence	Demonstrating Literacy and Mathematics Behaviours
		1		Demonstrate an understanding of the information and ideas in oral texts by retelling the story or restating the information, including the main idea	Oral Communication
		2		Identify the main idea and some additional elements of texts	Reading
	Alphabet Grid	Kindergarten	Students program their robot to travel to different letters on the alphabet grid in order to identify letters, and short words	Write simple messages using a combination of pictures, symbols, knowledge of the correspondence between letters and sounds, and familiar words	Demonstrating Literacy and Mathematics Behaviours
		1	Students program their robot to travel to different letters on the alphabet grid in order to spell short words	Spell some high-frequency words correctly	Writing
		2		Spell many high-frequency words correctly; spell unfamiliar words using a variety of strategies	Writing
Ozobot	Introduction to Ozobot	2	Students will observe the different ways in which the Ozobot moves and how their actions can influence its movements	Compose and describe pictures, designs, and patterns by combining two-dimensional shapes	Geometry and Spatial Sense
	Ozobot Search and Rescue	3		Draw items using a ruler, given specific lengths in centimetres	Measurement
		4		Estimate, measure, and record length, height, and distance using standard units; draw items using a	Measurement

				ruler given specific lengths in millimetres or centimetres	
		5	Using a real-world scenario, students will draw a program for their Ozobots to complete a task	Estimate, and measure the perimeter and area of regular and irregular polygons	Measurement
		6		Demonstrate an understanding of the relationship between estimated and precise measurements, and determine and justify when each kind is appropriate	Measurement
	Colour Coding	2	Students will program the Ozobot using a series of colour codes	Investigate and describe different kinds of movement; describe different ways in which objects move	Understanding Structures and Mechanisms: Movement
	Ozoblockly	5	Using the online software, students will program their Ozobots to carry out a task	Estimate, measure and represent time intervals to the nearest second; estimate and measure the perimeter and area of regular and irregular polygons using a variety of tools	Measurement
		6		Demonstrate an understanding of the relationship between estimated and precise measurements, and determine and justify when each kind is appropriate	Measurement
		7		Use estimation when solving problems involving operations with hole numbers, decimals and percents to help judge the reasonableness of a solution; add and subtract integers, using a variety of tools	Number Sense and Numeration

		8		Assess the social, economic, and environmental impacts of automating systems; use technological problem-solving skills to investigate a system; identify various types of systems	Understanding Structures and Mechanisms: Systems in Action
Dash	Introduction to Dash *(1 of 2)*	3	Students will be introduced to Dash's drag and drop programming software; focusing on programming the robot to drive in a variety of shapes using measurements and angles	Estimate, measure, and record length, height, and distance using standard units	Measurement
		4		Estimate, measure, and record length, height, and distance using standard units	Measurement
		5		Estimate and measure the perimeter and area of regular and irregular polygons using a variety of tools; measure and construct angles up to 90 degrees using a protractor	Measurement; Geometry and Spatial Sense
		6		Identify, perform and describe through investigation using a variety of tools, rotations of 180 degrees and clockwise and counterclockwise rotates of 90 degrees with, the centre of rotation inside or outside the shape	Geometry and Spatial Sense
		7	Students will be introduced to Dash's drag and drop programming software; focusing on programming the robot to drive in a variety of shapes using measurements and angles, examining how altering values affects the shape	Determine, through investigation using a variety of tools, relationships among area, perimeter, corresponding side lengths, and corresponding angles of congruent shapes; Identify, perform and describe dilatations through investigation using a variety of tools	Geometry and Spatial Sense

		8	Students will be introduced to Dash's drag and drop programming software; focusing on programming the robot to drive in a variety of shapes while illustrating the relationship between perimeter and area	Investigate and describe applications of geometric properties in the real world; determine, through investigation using a variety of tools relationships among area, perimeter, corresponding side lengths and corresponding angles of similar shapes	Geometry and Spatial Sense
Dash Obstacle Course *(2 of 2)*		3	Using a real-life situation, students will program Dash to navigate through an obstacle course; using estimated and measured distances	Estimate, measure, and record length, height, and distance using standard units	Measurement
		4		Estimate, measure, and record length, height, and distance using standard units	Measurement
		5		Estimate and measure the perimeter and area of regular and irregular polygons using a variety of tools; measure and construct angles up to 90 degrees using a protractor	Measurement; Geometry and Spatial Sense
		6		Demonstrate an understanding of the relationship between estimated and precise measurements, and determine and justify when each kind is appropriate	Measurement
		7		Solve multi-step problems arising from real-life contexts and involving whole numbers and decimals, using a variety of tools and strategies	Number Sense and Numeration
		8		Assess the social, economic, and environmental impacts of automating systems; use	Understanding Structures and Mechanisms: Systems in Action

				technological problem-solving skills to investigate a system; identify various types of systems	
LEGO Mindstorm - EV3	LEGO Mindstorm Introduction *(1 of 3)*	5	Students will be introduced to the LEGO Education programming software, and use it to code their robot to complete a variety of tasks.	Represent, compare and order whole numbers and decimal numbers from 0.01 to 100,000 using a variety of tools; count forward by hundredths from any decimal number expressed to two decimal places using concrete materials and number lines	Number Sense and Numeration
		6		Demonstrate an understanding of the relationship between estimated and precise measurements, and determine and justify when each kind is appropriate	Measurement
		7		Use estimation when solving problems involving operations with whole numbers, decimals and percents to help judge reasonableness of a solution	Number Sense and Numeration
		8		Translate between equivalent forms of a number; solve problems involving operations with integers, using a variety of tools	Number Sense and Numeration
		5	Using a real-life situation, students will program Dash to navigate through an obstacle course; using estimated and measured distances	Represent, compare and order whole numbers and decimal numbers from 0.01 to 100,000 using a variety of tools; count forward by hundredths from any decimal number expressed to two decimal places using concrete materials and number lines	Number Sense and Numeration

Obstacle Course *(2 of 3)*	6		Demonstrate an understanding of the relationship between estimated and precise measurements, and determine and justify when each kind is appropriate	Measurement
	7		Solve multi-step problems arising from real-life contexts and involving whole numbers and decimals, using a variety of tools and strategies	Number Sense and Numeration
	8		Translate between equivalent forms of a number; solve problems involving operations with integers, using a variety of tools	Number Sense and Numeration
Sensors *(3 of 3)*	5	Students will program their robots to use its sensors in order to accomplish a variety of tasks	Create, identify and extend numeric and geometric patterns using a variety of tools	Patterning and Algebra
	6		Identify, perform and describe through investigation using a variety of tools, rotations of 180 degrees and clockwise and counterclockwise rotates of 90 degrees with, the centre of rotation inside or outside the shape	Geometry and Spatial Sense
	7		Solve multi-step problems arising from real-life contexts and involving whole numbers and decimals, using a variety of tools and strategies	Number Sense and Numeration
	8		Assess the social, economic, and environmental impacts of automating systems; use technological problem-solving skills to investigate a system; identify various types of systems	Understanding Structures and Mechanisms: Systems in Action