Library Free-Workshops Curriculum (Sample)

***FIRST*® Robotics Canada thanks FIRST team 1241 (from Rick Hansen Secondary School) for their partnership in creating this document and supporting materials.**

Week 1 - Introduction to the Robot

Activity 1: **12:00 – 12:50** **What is a Robot?**	- What is FIRST? (10 mins) - What is a robot? (15 mins) - Android vs. Cyborgs (10 mins) - Matching activity where students stand under sign "Andoid" or "Cyborg" based on image displayed on screen. - Robot Vs. Machines (10 mins)
Activity 2: **12:50 – 1:15** **-Show and Tell**	Setup multiple stations with different types of robots - Bring in FRC Robots to show, students also get to drive the robot - LEGO MINDSTORM/EV3 robots to show with different sensors

Week 2 – Mechanisms and Simple Machines

Activity 1: **12:00 – 12:30** **Types of Mechanisms**	- Introduce Basic mechanisms and simple machines such as: Motors, Gears and Gear ratios, Sprockets, Levers, pulleys, wedges/incline planes, wheels and axles. - Demonstration Activities: Gear changing on bicycle, Torque Arm Challenge, Be a Ramp - Identify the simple machine matching game
Activity 2: **12:30 – 1:15** **Build Project**	Equipment required: Multiple types of mechanisms made out of LEGO kits including catapult (lever), pulley systems, gear boxes - Students are split into groups, and have to identify which mechanism they build using the parts in front of them. They build the functional simple machine with pictures that mentors show.

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Week 3 – Programming Workshop

	Senior	Junior
Activity 1: **12:00 – 12:25** **Introduction to Programming and Blindfold Activity**	- Explain the idea of breaking down into really small steps - Coloured Foam blocks to be arranged in particular way with 1 person blindfolded *Optional Activity: Setup a maze in class room using tape, and have 1 person blindfolded being guided through.	- Explain the idea of breaking down into really small steps - Jelly Sandwich Activity: Students have to clearly instruct Teacher in making a Jelly Sandwich including placing the bread, spreading jam, closing sandwich, and cutting it.
Activity 2: **12:25 – 1:15** **Different Types of Sensors and programming in LEGO MINDSTORM/ WeDo software**	- Introduce different types of sensors that are found on robots. Setup multiple stations with different types of robots/activities - Sensor Mashup station has LEGO MINDSTORM robot with lots of sensors - FRC Robot showing joystick feedback control -Show LEGO WeDo or LEGO MINDSTORM/EV3 Programming software highlighting basic programming structures -Build simple demonstration models such as a crane, merry go round (spins faster based on clicks) or colour sorter.	

Week 4 – Design Workshop

Activity 1: **12:00 – 12:20** **Introduction to Design**	Design Process – think things through before building! Good Vs Bad Design examples and get students to critique them and propose different solutions.
Activity 2: **12:20 – 1:15** **Building Lego MINDSTORM/EV3 kits**	Create simple robots/machines such as garage door opener, scissor lift crane, using Lego MINDTSORM/EV3 Kits. Robots should also be programmed to use particular sensors, or have automated motions based on knowledge from previous week.

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Week 5 – Mobility System of a Robot

Activity 1: **12:00 – 12:45** **Introduction to Mobility Systems**	- Create basic chassis using Lego MINDSTORM/EV3 Kits - Install 2 Motors and castor for mobile - Provide choice of gearing and wheels to students – Different sizes, different tread patterns -Install the motor wires, and test robot to see if all motors rotate in the proper direction -EV3 app should be installed on mobile devices in order to control the robot
Activity 2: **12:45 – 1:15** **Competition Challenge**	-Create an obstacle course using small parts -Teams will race against each other -Each team member gets a chance to drive the robot, and learn the controls on the joystick for tank drive configuration

Week 6 – Building the Robot Arm

Activity 1: **12:00 – 12:50** **Building Arm System**	- Create basic 2 motor arm for collecting a big object off the table top using Lego MINDSTORM/EV3 kits - Install Motors and Gears on arm system - Attach motor cables onto the controller - Test joysticks on mobile device to make sure wiring is correct
Activity 2: **12:50 – 1:15** **Competition Challenge**	-Create a pick and place configuration for starting and ending location for objects -Teams will race against each other to collect objects from pick up station and then place the objects to the drop off location -Each team member gets a chance to drive the robot, and learn the controls for the arm