EXCEED ROBOTICS

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Robotics Curriculum

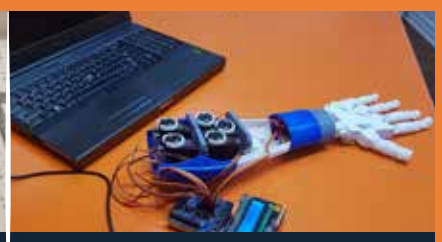
AGES 12 - 15

ROBOTICS CURRICULUM

1: Advanced C-Language Programming

2: Mechanical Design & 3D Printing

3: Electronics Microcontroller



4: Capstone Project

The Ultimate STEM Program for Future Innovators and Leaders

The robotics curriculum teaches students essential STEM skills including **Programming, Computer Design & 3D Printing and Electronic Circuits** with a handson, step-by-step approach

All Robotics courses follow a structured curriculum with daily challenges designed to promote critical thinking and experiential learning. The end goal of the Robotics curriculum is to develop a technical and soft skill set for students to start creating their own advanced robots, paving the way for innovation

PROGRAM DETAILS

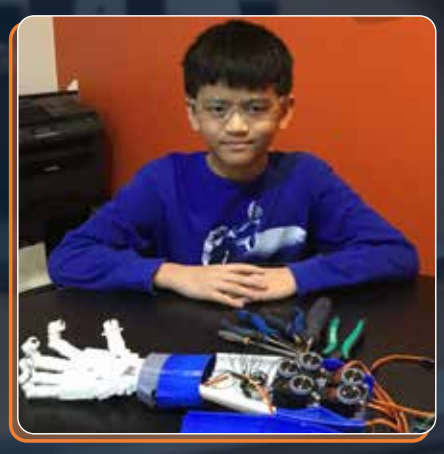
2-year curriculum

Classes once per week classes

One-hour in duration

6 max students per class

The Robotics curriculum was created by a team of mechatronics engineers with 25+ years of global industry experience with the aim of advancing STEM education amongst Canada's youth. The Robotics program's vision is to create a community of young innovators by developing computer science and engineering skills and directing them towards solving real-world problems



Robotics Alumni Projects

ADVANCED PROGRAMMING & ROBOTICS

COD-04: C-LANGUAGE FUNDAMENTALS

Prerequisite: COD-03

After developing the logic of programming robots using modular programming, text-based programming with C-language is introduced. C-language is the most powerful and useful programming language which is used commonly used in industry. The course begins teaching variables, datatypes, loops and conditional statements used to program robots. This course moves beyond graphical programming towards language-based coding which offers greater control for robot design and development.
A new robot platform is introduced to have students comfortable with transferring their knowledge to multiple types of robots.

COD-05: AUTONOMOUS STRUCTURE

Prerequisite: COD-04

This course focuses on programming structure for autonomous robot control. Learning about the structure for autonomous control is a critical step for students to start programming any robot to use any sensor to make decisions on its own. It has real world applications in self-driving cars, factory robots, etc. Various sensors including ultrasonic, touch, colour and gyro are introduced and utilized to complete advanced programming challenges.

COD-06: SMART CITIES CHALLENGE

Prerequisite: COD-05

This advanced programming competition course is based on Exceed's Smart Cities competition designed for Ryerson engineering students in 2019
Students program their robots equipped with multiple sensors and motors to autonomously navigate through a virtual city. They will write code for line following, flag detecting, gyro turning and crash avoidance to complete the urban challenge in the least amount of time

MEC-07: COMPUTER DESIGN FUNDAMENTALS

Prerequisite: MEC-06

To first course in the Mechanics series relates to the design of 3Dprinted mechanical parts. Students learn various design tools using Autodesk Fusion 360 to create their own designs.
Starting with sketching, students complete various design projects to practice using design tools and features. Through select projects, students will practice using fundamental tools in mechanical design. Design projects are assigned for students to independently apply their design skills and create functional mechanical components that could be 3D printed.

MEC-08: MACHINE DESIGN AND SIMULATION

Prerequisite: MEC-07

Building robots cannot be complete without learning how parts we design should fit together. This machine design course teaches students about the fundamentals of machine design including fits and clearances, structure design, levers, gears, and more.
Students will design each component of the machine and will assemble them together in the design software. By learning about joints and constraints, students will create a virtual simulation of their creations. In industry, design simulation is an essential tool used by engineers to predict functionality and performance before building a single prototype.

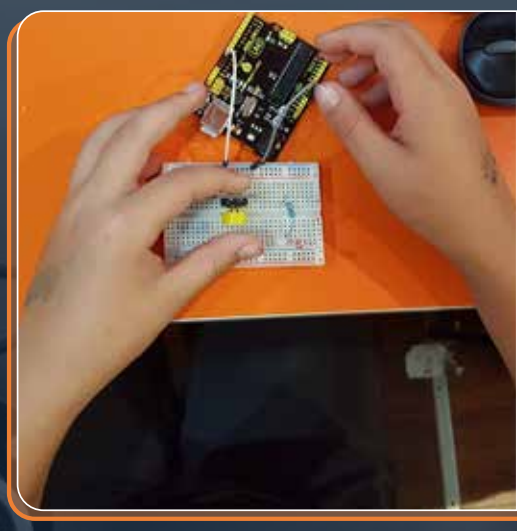
MEC-09: ELECTRONIC CIRCUITS

Prerequisite: MEC-08

The last course in this Mechatronics series is all about electronic circuits. After learning the fundamentals, students work on lab assignments by building and testing their own electronic circuits. Students will learn about principles of electricity and Ohm's law relating to voltage, current and resistance. Using multimeters to measure voltage/current, students take measurements to better understand the effects of the different electronic components. Electronic components including resistors, switches, motors and transistors will be covered in preparation for the next Microcontroller Programming series.

ARD-10: INTRODUCTION TO MICROCONTROLLERS

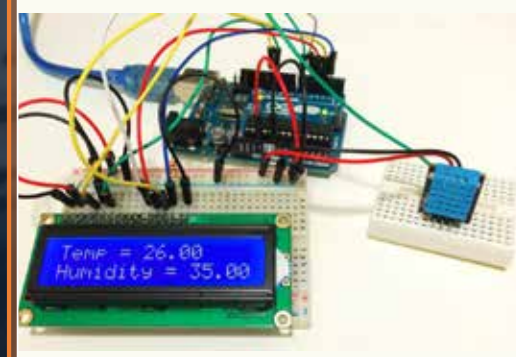
Prerequisite: MEC-09



The Arduino microcontroller is a widely used programmable development board that makers and hobbyists use to build robots amongst many other devices
Students will learn about digital and analog devices and introduced to Arduino-controlled circuits
Learning C-language programming in previous Programming & Robotics courses (COD-04,-05,-06) well prepared students for microcontroller programming which uses functions from the Clanguage

ARD-11: ADVANCED MICROCONTROLLERS I

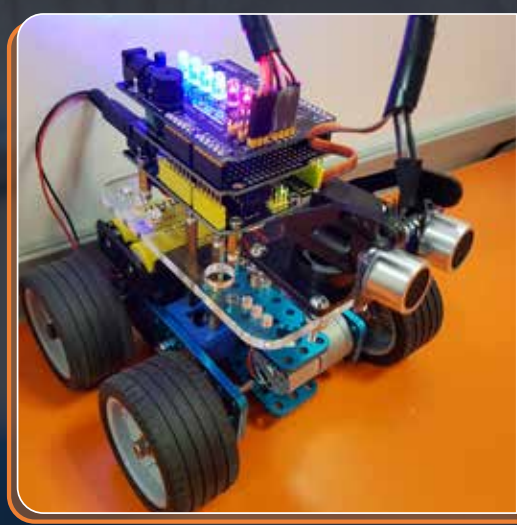
Prerequisite: ARD-10



The second microcontrollers course moves onto wiring and programming circuits using advanced output devices and complex sensors
Students will practice wiring and programming circuits using various electronic devices throughout this course. The aim is to have students feel comfortable with coding microcontrollers to make decisions or vary output using any type of sensor input

ARD-12: ADVANCED MICROCONTROLLERS II

Prerequisite: ARD-11



Building on our knowledge in creating circuits using analog sensors, this course teaches programming to drive and control various types of motors (DC, servo, stepper) allowing students to create and program complex microcontroller circuits.
Combined with the previous Mechanical Design courses, learning how to build and program such advanced microcontroller circuits is the final step towards creating custom robots!

ARD-13: LOGIC BUILDER

Prerequisite: ARD-12

The culmination course for electronics and microcontroller programming, students are given a smart home outfitted with a collection of electronics, sensors and motors
This course will challenge students to apply their skills in the previous three microcontrollers courses towards developing and programming smart home systems
A temperature sensor to activate the air conditioning fan, a motion sensor to turn on the garage light, a light sensor to close the blinds when it gets dark...our homes are becoming smarter thanks to our students!

ARD-14: PROGRAMMING CHALLENGE

Prerequisite: ARD-13

Students put their talents in programming, mechanical design and electronic circuits on full display by creating their own competition robot from scratch. This means computer designing, 3D printing, wiring electric circuits, assembling and programming to create a competition robot
Students will have the opportunity to use their creativity alongside their technical skills to win over the judges. This first course focuses on designing, 3D printing and assembling the mechanical parts and wiring electronic circuits prior to moving onto programming

ARD-15: PROGRAMMING PROJECT

Prerequisite: CAP-14

The final capstone course has students focus on programming their robotic creation and submitting a YouTube video to enter the Capstone Competition against all Exceed graduating students
Competition entries will be evaluated on key technical skills as well as a public vote to add an element of marketing
Graduation day is held on the last day of class where students provide a private screening of their robots and YouTube videos to parents and instructors and celebrate their achievements!

ALUMNI WORKSHOP




Open to Robotics and Python graduates

Where all the magic happens...

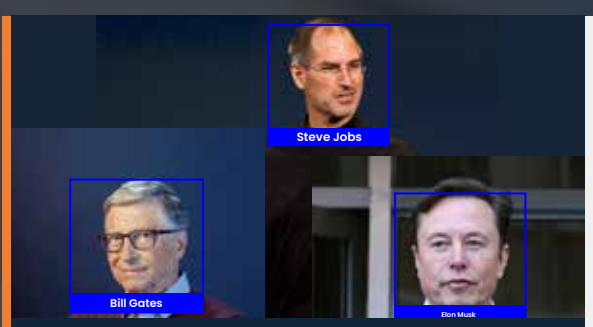
For most graduates who want to keep learning past graduation, the Alumni Workshop provides an incredible opportunity for students to apply their technical skills and work on bigger robotics projects It is an environment designed to accelerate personal growth resulting from working leading edge projects and learning skills such as conducting research, submit budgets and timelines essential for real-world success

The idea of a workshop where engineers mentor students to develop the coolest projects was the original vision of Exceed Robotics...the Robotics curriculum was created afterwards as the means to this end

What's Next?

ALUMNI WORKSHOP

A project-based environment where students apply their learned skills and work on their own creations (products, programs and apps) under the supervision of a workshop manager. Ideal for students who are interested in working on their own ideas and projects.



Python & Artificial Intelligence

Python & Artificial Intelligence is suitable for students who wish to take their leaning to the next level by joining Python and Artificial Intelligence curriculum where they learn AI applications such as Face Detection or Speech Detection using Raspberry Pi.