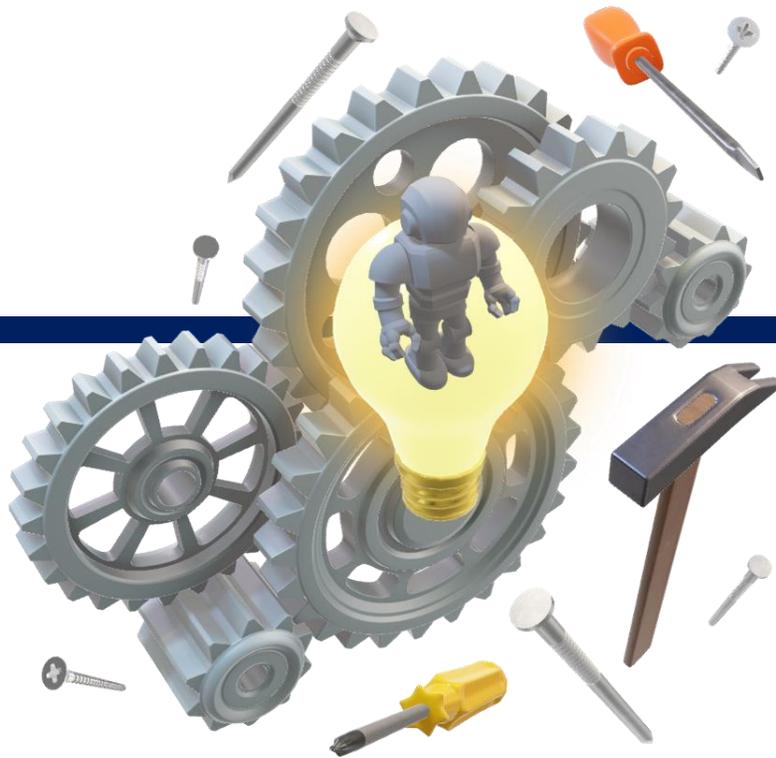


# Explore, Design and Build A Mechanical Engineering Bootcamp



**December 11 – 14, 2023**

Open to high school students grades 10-12.

This boot camp help you explore the exciting field of mechanical engineering and build valuable skills. Learn how mechanical engineers solve problems and make a difference using modern engineering software. Find out about the mechanical engineering degree program and future career options.

- Enjoy hands-on activities and build your critical thinking skills.
- Improve your communication and collaboration skills.
- Make new friends with similar interests.
- Enjoy an unforgettable campus experience at AUS.

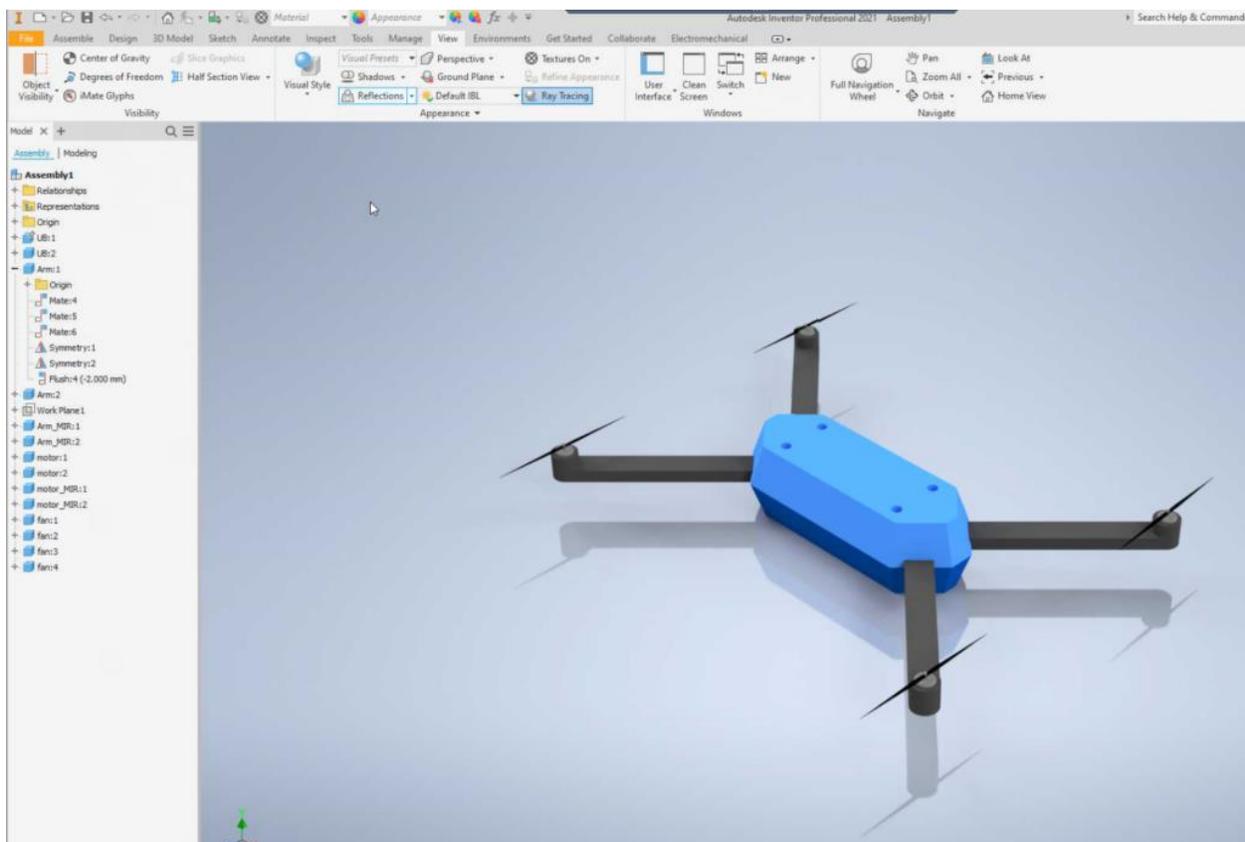
## Module 1: Design/Build and 3D Printing Day

You will learn how designers use Autodesk Inventor to sketch and build their products. Designers start with making a 2D sketch, which is then used to make a 3D model for the needed part. All parts are assembled together to make the product. A 3D printed prototype can be tested in order to improve part shape and functionality. You will try new things and learn new skills!

### Outline

On this day of the camp, you will:

- learn how to use Autodesk Inventor to model a quadcopter
- learn how to use Autodesk Inventor to assemble all quadcopter parts
- learn how a 3D printer works
- use a 3D printer to make some parts of the prototype



## Module 2: Let's Make Our Own Products

The goal of workshop day is to introduce you to the manufacturing field. In addition to the technical skills mentioned in the outline, you will learn to work as a team, share knowledge and help each other. You will learn how things are made and how much effort and time it costs to make a product. By the end of the day, you will go home with useful things you have made.

### Outline

Throughout the workshop day, you will learn:

- how to read and convert drawings to real parts
- manufacturing methods like sheet metal work and metal forming
- how to use hand tools like the power drill, hacksaw, files, sheet metal sheet metal cutters, and a spot-welding gun
- how to take measurements using precise measuring tools like the Vernier caliper, micrometer and height gauge
- how to assemble parts by spot welding and the shrink fit method



## Module 3: Crash Course on Robotics and Mechatronics

The crash course is designed to introduce you to computer algorithms through graphical programming tools and a robotics kit. You will get the chance to build your own LEGO robot and learn how to program it. The course activities are also set to emulate the autonomous capacity of a modern car, such as its special awareness, intelligent cruising, lane keeping and obstacle avoidance. You will leave with a deeper understanding of what makes a system autonomous and intelligent.

### Outline

On this day of the boot camp, you learn to:

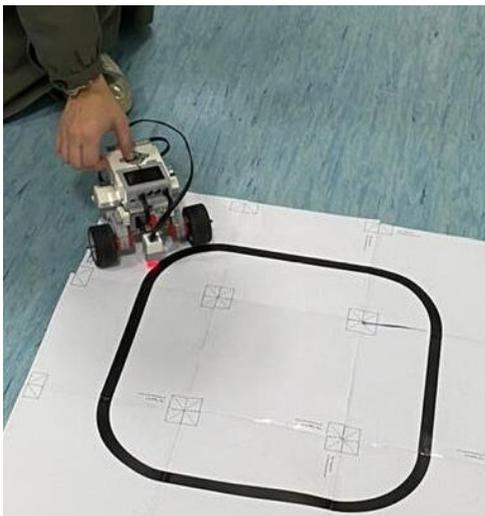
- explain the significance of learning programming
- define and recognize a robot
- develop computational thinking skills
- create graphical algorithms
- build functional robots with the LEGO EV3 robotics kit
- program LEGO robots to solve simulated problems

The crash course is designed to introduce you to mechatronics systems using the Arduino Inventor kit. You will learn how to build and program a mechatronics system. The course projects are designed to mimic real mechatronic systems and you will get familiar with the basic elements of a mechatronic system. At the end of the day, you will have a good understanding of mechatronic systems.

### Outline

On this day of the boot camp, participants will:

- learn to explain the significance of mechatronics systems
- get an overview of Arduino and become familiar with Arduino software
- learn how to send an output signal
- learn how to read an input signal
- build a functional mechatronics system with the Arduino inventor kit



## Module 4: Renewable Energy and Automotive Engineering

Renewable energies sources are becoming increasingly important in today's world. They are clean and aid in the fight against climate change and pollution. They are inexhaustible as they are obtained from natural processes and convert existing flows of energy into useable forms. In this module, you will learn more about solar power.

Automotive engineering deals with the design, development, manufacturing, testing, maintenance and servicing of automobiles including cars, trucks, motorcycles and other vehicles, and the related sub systems. In this module, you will learn about the various mechanical design concepts related to design, manufacture and assembly of the engine and the thermodynamic processes required to convert petrol or diesel fuel to mechanical engine power.

### Outline

On this day, you will learn:

- The basics of converting solar energy into electrical energy by assembling a system of a solar panel, charge controller, battery, inverter and load center.
- The basics of converting wind energy into electrical energy using a lab scale aero generator and wind turbine, and observing the effect of air velocity, air direction, turbine blade configuration and load on the power generation performance.
- The design, operation and performance of internal combustion engines including petrol and diesel engines, 2-stroke and 4-stroke engines, and 4-cylinder and 6-cylinder engines.
- The design and operation of a gearbox and a differential.

