

# Arduino Engineering Kit

*with Online Training*



## Overview

The Arduino Engineering Kit is the ideal solution for university students, providing a state-of-the-art, hands-on incorporation of Arduino technology in an educational setting.

The kit is primarily for three types of users:

- Students learning about engineering at a university or at a vocational school (e.g., Introductory Engineering, Controls, Mechatronics courses);
- Professors teaching engineering who also want practical resources to demonstrate engineering concepts;
- Makers with an interest or background in engineering, either professionally or as a hobby.

The Arduino Engineering Kit includes three cutting-edge Arduino-based projects so that students can learn fundamental engineering concepts, key aspects of mechatronics, and MATLAB and Simulink programming. These projects will challenge them intellectually and help them develop physical engineering skills — and they're just fun to do.

### 1. **Self-Balancing Motorcycle**

This motorcycle will manoeuvre on its own on various terrains and remain upright using a flywheel for balance. It's very exciting to build and to see in action.

### 2. **Mobile Rover**

This vehicle can navigate between given reference points, move objects with a forklift and much more. It's very fun to make and use.

### 3. **Whiteboard Drawing Robot**

This amazing robot can take a drawing it's given and duplicate it on a whiteboard. It's most impressive.

The kit is sold in a hard plastic, stackable tool box for storage and years of reuse. Inside the box is an easy-to-use Arduino MKR1000 board, several customized parts, and a complete set of electrical and mechanical components needed to assemble all three projects. See below for a detailed list of what's included in the kit.

In addition to the state-of-the-art, high-quality, open-source hardware provided, after registering online, the student will have access to a dedicated e-learning platform and other learning materials. Additionally, they are granted a one-year individual license for

MATLAB and Simulink. This provides them with hands-on experience in system modeling and embedded algorithm development. (Facility to renew the annual licence is available)

## Technical Specifications

Each Arduino Engineering Kit includes:

### BOARDS

- 1 Arduino MKR1000 Board
- 1 Arduino MKR Motor Shield
- 1 Arduino MKR IMU Shield

### ELECTRICAL COMPONENTS

- 1 DC Motor
- 2 Geared DC Motors with Encoder
- 1 Standard Micro Servo (180 degrees)
- 1 Hall Sensor Module
- 1 Ultrasonic Sensor Module
- 1 Webcam
- 1 LiPo Battery
- 1 LiPo Battery Charger
- 1 Micro USB Cable
- 1 3-pin to 4-pin Tinkerkit Module Cable
- 1 3-pin Tinkerkit Module Cable

### MECHANICAL COMPONENTS

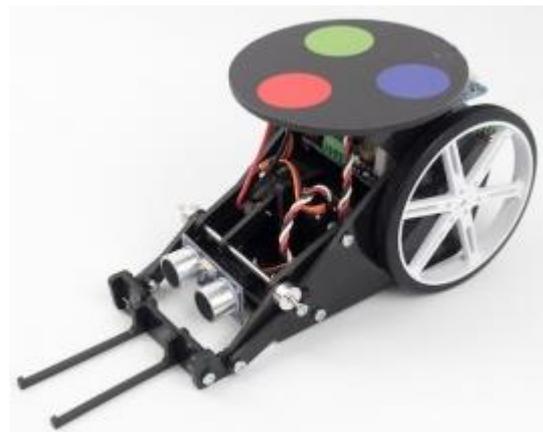
- 3 Sets of Assembly Pieces
- 2 Wheels
- 1 Caster Wheel
- 1 Timing Belt
- 2 Timing Pulley
- 2 DC Motor Mounting Brackets
- 1 Metal Shaft (90mm)
- 2 Metal D Shafts (50mm)



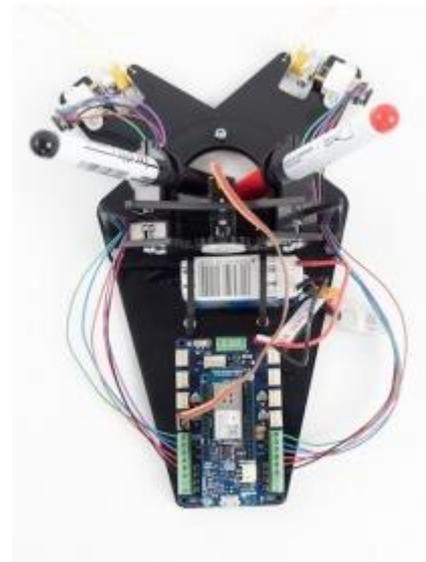
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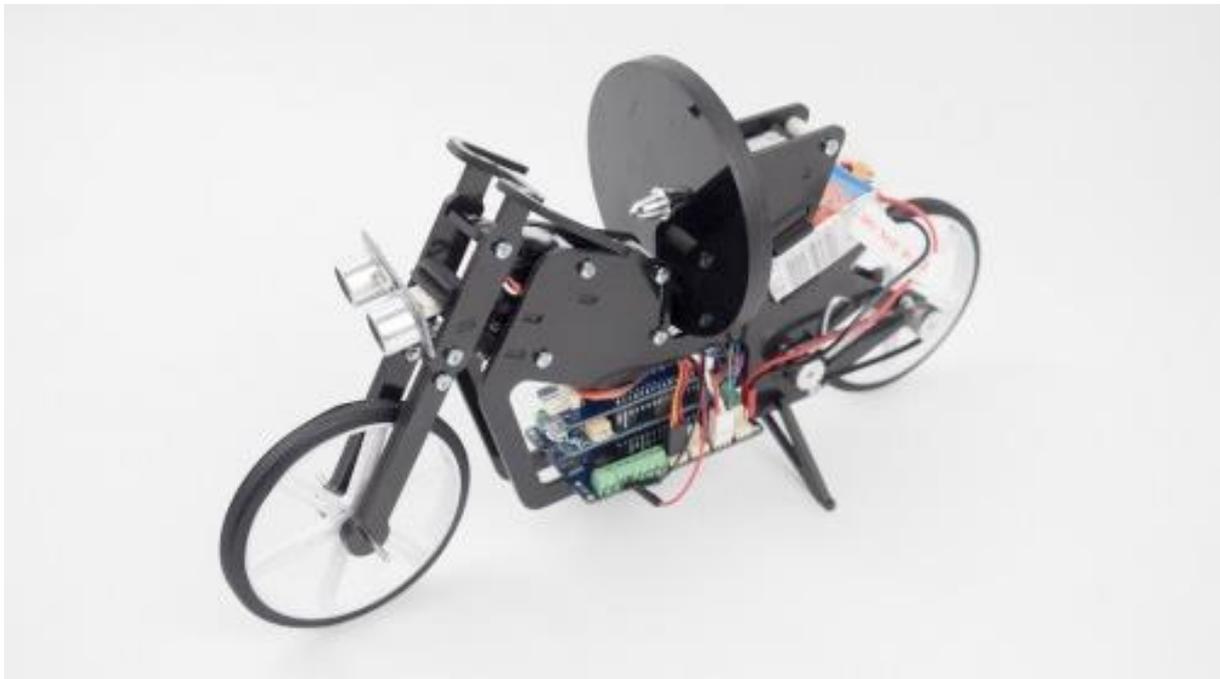
Includes 1-year individual user license of:



- 2 Sets of Distance Spacers (6mm, 17mm)
- 2 Sets of M2 Bolts (10mm, 25mm)
- 3 Sets of M3 Bolts (10mm, 15mm, 25mm)
- 1 Set of M2 Nuts
- 1 Set of M3 Nuts
- 1 Set of M3 Lock Nuts with Nylon Insert
- 3 Shaft Collars
- 1 Propeller Adapter Screw
- 2 Magnets Ø8 mm
- 1 Thread 5m
- 2 Whiteboard Pens
- 1 Sticker for Vision Recognition



Since some components are used in more than one project, users are limited to one fully assembled project at a time.



## **Documentation**

The Arduino Engineering Kit is built on its own Education Learning Management System (LMS) with step-by-step instructions and lessons. The content of this kit is divided into six chapters, featuring a short introduction, a getting-started guide for the tools that will be used, a concepts section, and finally the projects themselves. Users will receive access to the online platform for one year and can purchase additional licenses to extend platform access.

Learning objectives include, but are not limited to the following:

- MATLAB and Simulink basics;
- Connect MATLAB and Simulink to the Arduino MKR1000 and read/write data from connected sensors (encoders, IMU, hall sensor) and actuators (DC motors, servo motor)
- Analyze and visualize data from Arduino;
- Apply custom algorithms for complex math operations, image processing, and PID control;
- Model and simulate the behavior of dynamic systems in Simulink;
- Incorporate logic-based algorithms that define system behavior for different “states” (e.g. move forward, turn, stop)
- Build and run a working Arduino application from a Simulink model;
- Tune and optimize Simulink model parameters as the application is running on Arduino;
- Download the completed Simulink model for standalone execution on the Arduino

The online platform will help students learn fundamental engineering concepts, key aspects of mechatronics, and MATLAB and Simulink programming.

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