

# Mechatronics workshop

For students from National Formosa University @ UTSA

## Workshop Outcomes

At the end of this workshop students will be able to:

1. Construct simple circuits using resistors, Light Emitting Diode (LED), potentiometer, push-button, and breadboard.
2. Learn the basics of Arduino UNO and Arduino software.
3. Learn basic C programming basics such as variables, function, loops, and conditional statements.
4. Learn to use the analog input/output and digital input/output pins on the Arduino.
5. Program microcontrollers to read sensor values and turn motors.
6. Construct and program a differential drive car to move around and detect obstacles

## Equipment list

1. [VKMaker Robot car chassis kit with arduino, motors, and ultrasonic sensor \(\\$22.88\)](#)
2. [Elegoo Basic electronics kit with breadboard, resistors, diodes, potentiometers, push-button switch and more \(\\$17.90\).](#)
3. [Screw driver set, Flat and Phillips head \(\\$7.99\).](#)
4. [Eclipse wire stripper 20 to 30 AWG \(\\$4.72\).](#)
5. [8 AA batteries \(\\$4.78\).](#)
6. [Arduino software \(free download\)](#) Please download and install the software appropriate to your operating system.
7. [Arduino language reference](#) This page will serve as a reference for the various commands we issue through the Arduino IDE.

## 1 Basics of Arduino and Arduino Software (C language)

Download and follow the instructions on this handout

<https://github.com/pab47/mechatronics/blob/main/1.Arduino-basics.pdf>

This handout covers the following items.

1. First program (print 'hello')
2. Basics of resistor, LED, breadboard, potentiometer, push-button switch, and wiring.

3. Basic Arduino functions: `setup()`, `loop()`
4. Basic input/output functions: `Digitalwrite()`, `DigitalRead()`, `AnalogWrite()`, `AnalogRead()`, `pinMode()`;

## 2 Servo and Ultrasonic sensor

Download and follow the instructions on this handout

<https://github.com/pab47/mechatronics/blob/main/2.Arduino-servo-sensor.pdf>

This handout covers the following items.

1. Conditionals, if-else statement
2. Input/Sensor: Ultrasonic sensor for distance measurement
3. Output/Servo motor: Position control

## 3 DC motor

Download and follow the instructions on this handout

<https://github.com/pab47/mechatronics/blob/main/3.Arduino-motor.pdf>

This handout covers the following items.

1. H-bridge (motor controller)
2. DC motor: Bidirectional and speed control of motor

## 4 Build and control a differential drive car

Download and follow the instructions on this handout

<https://github.com/pab47/mechatronics/blob/main/4.Arduino-car-project.pdf>

This handout covers the following items.

1. Assembling the car
2. Electrical wiring
3. Programming

At the end of this exercise you will have got the ultrasonic sensor to rotate using the servo and the DC motor spinning the wheels.

## 5 Project - Obstacle avoiding car

**Exercise (submit a video via email):** Program the Arduino to create an obstacle avoiding robot. Here is an example of the completed obstacle avoiding car: <https://youtu.be/I2PdLCVFFyo> (30 seconds)