

Mechatronics workshop

For students from National Formosa University @ UTSA

Workshop Outcomes

At the end of this 1.5 day 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)

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();

Read the file *1.basics/Arduino-basics.pdf* and follow the instructions.

2 Servo and Ultrasonic sensor

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

Read the files *2.servo_sensor/Arduino-servo-sensor.pdf* and follow the instructions.

3 DC motor

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

Read the files *3.dc_motor/Arduino-motor* and follow the instructions.

4 Project – Obstacle avoiding car

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

Read the files *4.car/Arduino-car-project* and follow the instructions. 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.

Exercise: Program the Arduino to create an obstacle avoiding robot. Here is an example: <https://youtu.be/I2PdLCVFFyo> (30 seconds)