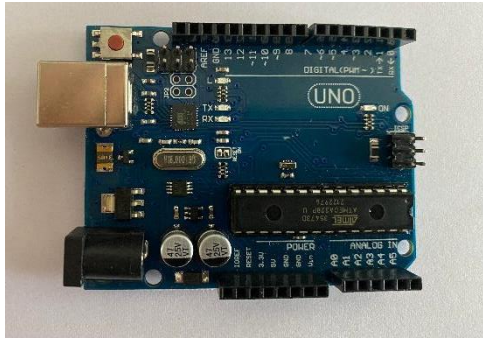


ENG1013 Student Kit Component Guide

Part Number	Quantity	Description
ATmega328 Controller Board Uno	1	UNO Microcontroller
GS830	1	Breadboard
HW-131	1	Power supply module +9V DC jack
HC-SR04	1	Ultrasonic sensor
	1	DC motor
	1	Fan Blade
		Jump wires
PN2222	4	NPN Transistor
1N4007	2	Diode Rectifier
1DC103J-EC	1	NTC Thermistor 10k Disc, 2.5mm Dia x 0.8mm W
RD3480	1	Light Dependent Resistor (48K-140K/10M 30MW 5x4 mm)
RGB LED	1	Multicolour LED
	1	Type B USB cable
Resisters	10 each	10 Ω ,100 Ω , 220 Ω , 330 Ω ,1 k Ω , 2 k Ω , 5.1 k Ω ,10 k Ω , 100 k Ω , 1 M Ω
SRD-05VDC0SL-C	1	5V Relay
HW-504	1	Joystick Module
RP7518	1	Potentiometer 100 k Ω
	1	Passive Buzzer
ARTC4330	1	Active Buzzer
SN74HC595	1	Shift Register IC
L293D	1	Dual Full bridge motor driver
SW-520D	1	Tilt Switch
SPST	5	Micro Tactile switch (push button switch)
LEDs	5 Each	White , Red, Green, Blue, Yellow LEDs
NE556N	1	Dual Timer IC
100nF,10nF	2 Each	Ceramic Capacitor
1 μ F, 4.7 μ F, 10 μ F, 47 μ F,100 μ F	5 Each	Electrolytic Capacitors
Small SPDT	1	Slide Switch (small)
5461AS-1	1	4 Digit 7 Segment display
	1	Multimeter
	1	Multimeter Probes
	1	Screw driver

Part Details

UNO Micro Controller



This is Arduino Uno open source microcontroller board. Arduino uno is based on ATmega 328p microchip.

Operating Voltage: 5V

Recommended input Voltage: 6V-12V

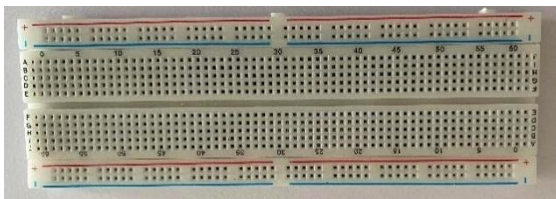
Digital I/O: 14 (6 PWM)

Analog Inputs: 6

Flash Memory: 32KB

Please refer to the data sheet for more information

Bread Board



These are components used to quickly prototype and connect up circuits by pushing component terminals into the holes.

Groups of holes in the breadboard are electrically connected together inside the breadboard to form electrical "nodes". **Keep this in mind when constructing your circuits on breadboards.**

Read the lab manual regarding breadboards to learn which holes are connected to each other and how to effectively use breadboards.

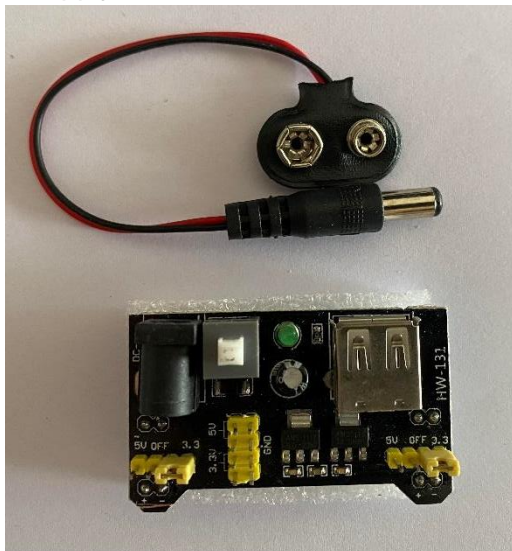
Link: [Breadboard basics](#)

Video: [Inner workings of breadboard](#)

Video: [How to wire circuits from schematics](#)

Video: [Tips for good breadboarding technique](#)

Power Supply module + 9V Jack



This is a power supply module compatible with 3.3V and 5V.

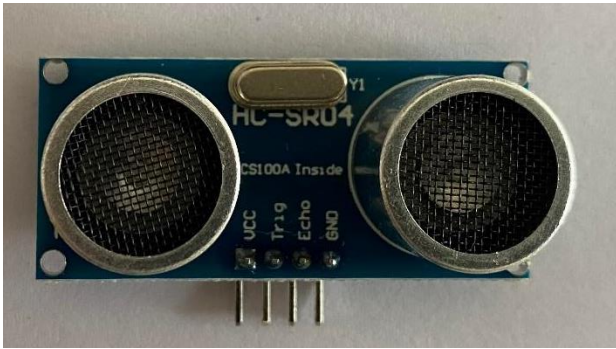
Input voltage is DC 6.5V -12V or the USB power supply.

Output voltage can be switched between 3.3V and 5V

9V Jack can be connected to a 9V battery and power the Arduino Uno microcontroller, when the USB power is not sufficient.

Please refer to the data sheet for more information

Ultrasonic Sensor



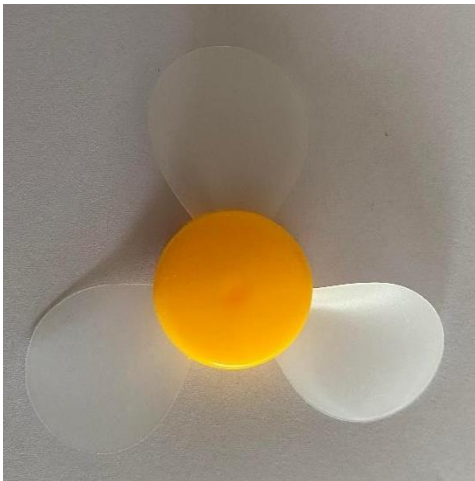
This is an ultrasonic distance sensor capable of non-contact distance measurements from 2cm - 400cm. This sensor consists of two ultrasonic transducers. One transducer converts the electric signal into ultrasonic sound pulses and the receiver will listen to the transmitted pulses to calculate the distance. Please refer to the data sheet for more information

DC Motor



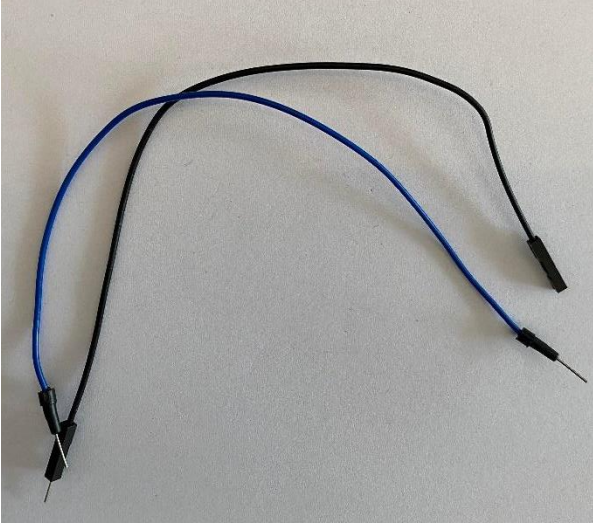
This component is a direct current (DC) motor. This component takes the electrical power and convert that energy to mechanical rotation. In order to control the motor rotation direction, applied voltage polarity needs to be inverted.

Fan blades



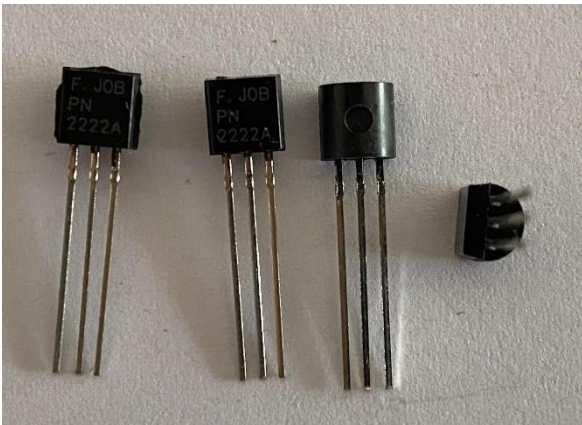
This component is a fan blade. This can be mounted in to the DC motor to make the fan blades rotate in the desired direction

Jump Wires



These components are jump wires. This is an electrical wire with a connector or a pin at each end. Mainly jump wires are used to connect two points in a circuit. Jump wires can be used to connect the components to the breadboard or to the components to each other without soldering.

NPN Transistor



You have been given NPN (2N2222) general purpose transistors. You need to check the datasheet that corresponds to the part number to find which pins correspond to the Base, Emitter and Collector.

Note that different NPN transistor part numbers use two different pin configurations, so make sure you get the right datasheet!

Diode rectifier



These diodes have a turn on voltage of around 0.7 V and are used to ensure that current only moves in a particular direction.

The silver stripe on one end indicates the negative terminal (cathode) of the diode.

Thermistor



This is a component that changes its resistance between the two terminals as the temperature of the blue body varies.

The thermistor has a resistance of 10 k Ω at 25°C. It should have a resistance of approximately 5 k Ω at about 40°C. You can get a more accurate indication using a Multimeter and heating up the resistor to around body temperature if you want.

Light Dependent Resistor



This is a component that changes its resistance between the two terminals as the light intensity of shining on the sensor varies.

As the light intensity increases, the resistance between the two terminals will decrease. You should measure the resistance with a Multimeter under different lighting conditions to determine how it behaves.

Multi Colour LED



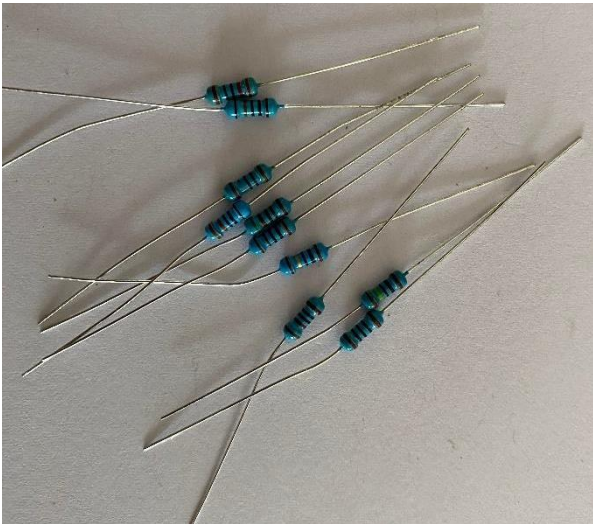
This is an RGB LED. This component consists of a common cathode and three more pins for the Red, Green and Blue. RGB LEDs can either be common cathode or common anode. The easiest way to identify the type is to put the Multimeter in the connectivity mode and place the RED probe on the longest leg and the black probe on the other leg. If the LED lights up it is a common anode LED.

Type B USB Cable



This is a type B USB cable, which is used to communicate between the laptop/pc and the Arduino board. For smaller circuits, power from the USB port is sufficient.

Resistors



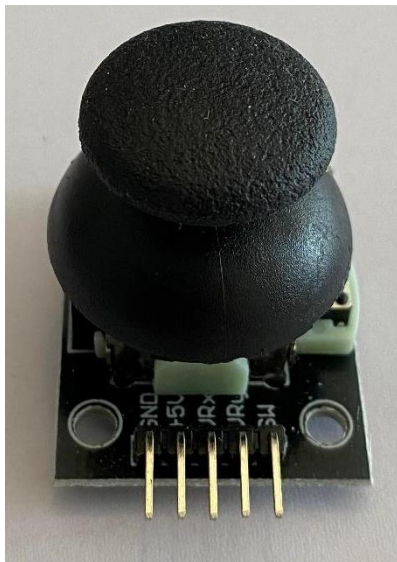
These components are resistors. This component is used to limit or regulate the current flow in an electronic circuit. We have provided you with 10 Ω , 100 Ω , 220 Ω , 330 Ω , 1 k Ω , 2 k Ω , 5.1 k Ω , 10 k Ω , 100 k Ω , 1 M Ω resistors. Resistor values can be identified either using a Multimeter or the colour stripes printed in the resistor.

5V Relay



This component is a relay, a type of electrically controlled switch. This component has three high voltage terminals. Normally closed, Normally open and the common terminal. This side is connected to the component you need to control. The other terminals are connected to the Arduino for the control signal. Please refer to the data sheet for more information.

Joystick Module



This is a joystick similar to the ones that is found in Analog gamepads. This module has a x-axis potentiometer and y-axis potentiometer to capture the x and y movement. Furthermore this component is equipped with a pushbutton. Joystick is module has five pins.

GND: This will be connected to the Arduino ground pin

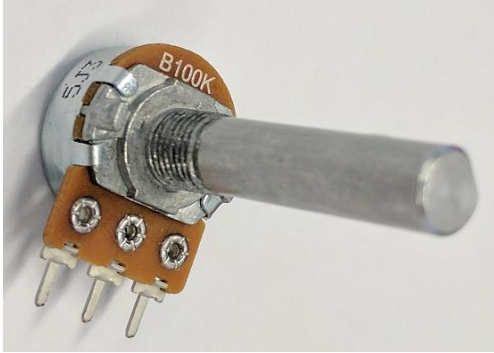




+5V: Power supply pin to the module

VRx: Gives the readings of analog values in horizontal direction

VRy: Gives the readings of analog values in horizontal direction

SW: This is push button switch output

Please refer to the data sheet for more information. **We will not be using this component this semester**

<p>Potentiometer</p> 	<p>This is a variable resistor that changes its resistance depending on the rotational position of the central spindle.</p> <p>The resistance measured between the two outer terminals is 100 kΩ, while the resistance between the middle and an outer terminal - say the left terminal can be varied.</p> <p>If the resistance between the left and middle terminal is R_1 then the resistance between the middle and right terminal would be $(100\text{ k}\Omega - R_1)$.</p> <p>Video: How to solder wire to the potentiometer</p>
<p>Passive Buzzer</p> 	<p>This component is a passive buzzer, which is an electromagnetic speaker used to generate sound signals of different frequencies. Furthermore this buzzer needs a signal source in order to generate the sound.</p> <p>Please refer to the data sheet for more information</p>
<p>Active Buzzer</p> 	<p>This component is an active buzzer. Which can generate the sound independently. You can simply turn it on and off in order to generate the sound.</p> <p>Please refer to the data sheet for more information</p>
<p>Shift Register</p> 	<p>This is an 8 bit shift register. The most common use of this component is to convert a serial input into a parallel output. This component allows additional inputs to be controlled by a microcontroller by converting a sequence of data from a serial to a parallel representation. For more information please refer to the datasheet.</p>
<p>Motor Driver</p> 	<p>This component is a motor driver IC. This is a 16 pin IC which can provide bi-direction control signals to two motors simultaneously. Motor drivers normally take a low current input signal from the microcontroller and use this to switch a high current motor drive signal in order to drive the motor.</p> <p>For more information please refer to the datasheet.</p>

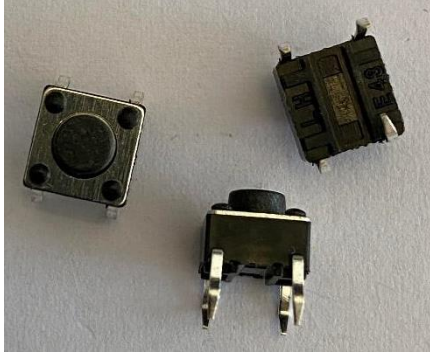
Tilt Switch



This component is a vibration/ tilt sensor. **NOT a capacitor.** This component can be used to detect the tilt in a specific direction. This component has a trigger angle of 15 degrees, and its pins do not have any polarity.

Please refer to the data sheet for more information. **We are not using this component this semester.**

Push Button



This is a pushbutton. Push buttons are commonly used to send a signal to the controller or to turn on or turn off an electronic component. A push button has two positions, either: momentary on and normally off, or momentary off and normally on.

LED



This component is a LED (Light Emitting Diode). This is a semiconductor device that emits lights when the current passes through. In your project kit you have five LEDs of White, Red, Green, Blue, Yellow. Long leg of the LED is the anode and the short leg of the LED is the cathode. These LEDs have a turn on voltage of around 2V.

Dual Timer



This is a timer IC which has two inbuilt 555 timer ICs. This integrated chip can be used to create timing, delay, pulse generation and oscillator circuits.

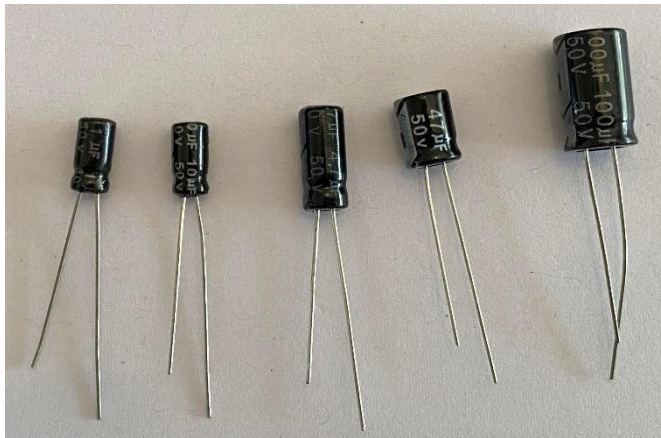
Please refer to the data sheet for more information

Ceramic Capacitors



This component is a ceramic capacitor. This component is commonly used for coupling, decoupling, smoothing and filtering purposes. In the project kit you have two ceramic capacitors 100nF, 10nF. Please refer to the data sheet for more information

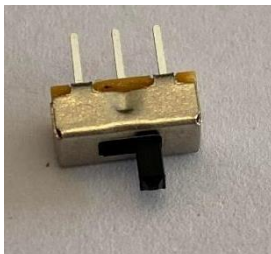
Electrolytic Capacitors



These components are electrolytic capacitors. These capacitors are designed to achieve high capacitance in small physical sizes. However, note that this means they only act as capacitors for one direction of current flow (ie they have **polarity**). You have provided with two of each 1µF, 4.7µF, 10 µF, 47 µF, 100 µF capacitors.

Please refer to the data sheet for more information

Slide Switch



This component is a mechanical switch that slides from open(Off) position to close (ON) position allowing the current to flow. Slide switches are commonly used to control the current flow in a circuit.

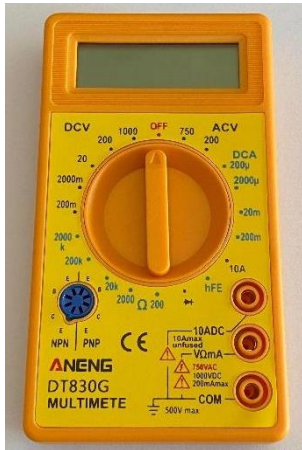
4 digit 7 Segment Display



This component is a 7 segment display with 4 digits. Each digit consists of 7 LED segments, plus one for the decimal point, for a total of 8. For the wiring instructions and other specifications, please refer to the datasheet.

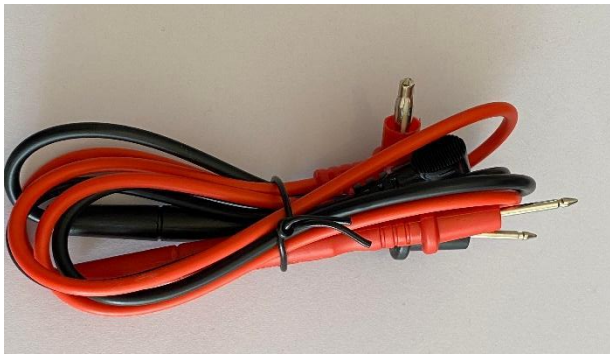
Please refer to the data sheet for more information

Multimeter



This component is a Multimeter. This component can be used to measure the electrical current, voltage, connectivity and resistance over several ranges of values. Note its internal resistance is 1 M Ω

Multimeter probes



These components are the Multimeter probes. Black probe is normally connected to the COM port in the Multimeter and the depending on the measurement type red probe can either be connected to the 10ADC or V Ω mA port

Multimeter Screwdriver



This component is the Multimeter screwdriver. Which can be used to remove the two screws in the back of the Multimeter to connect the battery.