1. **Arduino Uno R3:**

Arduino is an open source programmable circuit board that can be integrated into a wide variety of makerspace projects both simple and complex.  This board contains a microcontroller which is able to be programmed to sense and control objects in the physical world.

The Arduino Uno R3 is a microcontroller board based on a removable, dual-inline-package (DIP) ATmega328 AVR microcontroller. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs). Programs can be loaded on to it from the easy-to-use Arduino computer program. The Arduino has an extensive support community, which makes it a very easy way to get started working with embedded electronics. The R3 is the third, and latest, revision of the Arduino Uno.

**Board Breakdown:**

Here are the components that make up an Arduino board and what each of their functions are.

**Reset Button** – This will restart any code that is loaded to the Arduino board

**AREF**– Stands for “Analog Reference” and is used to set an external reference voltage

**Ground Pin** – There are a few ground pins on the Arduino and they all work the same

**Digital Input/Output** –  Pins 0-13 can be used for digital input or output

**PWM** – The pins marked with the (~) symbol can simulate analog output

**USB Connection –** Used for powering up your Arduino and uploading sketches

**TX/RX** – Transmit and receive data indication LEDs

**ATmega Microcontroller** –  This is the brains and is where the programs are stored

**Power LED Indicator** – This LED lights up anytime the board is plugged in a power source

**Voltage Regulator** – This controls the amount of voltage going into the Arduino board

**DC Power Barrel Jack** – This is used for powering your Arduino with a power supply

**3.3V Pin** – This pin supplies 3.3 volts of power to your projects

**5V Pin** – This pin supplies 5 volts of power to your projects

**Ground Pins** – There are a few ground pins on the Arduino and they all work the same

**Analog Pins** – These pins can read the signal from an analog sensor and convert it to digital

1. **IR Sensor:**

An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment.

There are two types of infrared sensors: active and passive. Active infrared sensors both emit and detect infrared radiation. Active IR sensors have two parts: a light emitting diode (LED) and a receiver. When an object comes close to the sensor, the infrared light from the LED reflects off of the object and is detected by the receiver. Active IR sensors act as proximity sensors, and they are commonly used in obstacle detection systems (such as in robots).

1. **LCD 16\*2:**

An LCD is an electronic display module which uses liquid crystal to produce a visible image. The 16×2 LCD display is a very basic module commonly used in DIYs and circuits. The 16×2 translates o a display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5×7 pixel matrix.

**16×2 LCD** is named so because; it has 16 Columns and 2 Rows. There are a lot of combinations available like, 8×1, 8×2, 10×2, 16×1, etc. but the most used one is the 16×2 LCD. So, it will have (16×2=32) 32 characters in total and each character will be made of 5×8 Pixel Dots.  A Single character with all its Pixels is shown in the below picture.

**Features of 16×2 LCD module:**

* Operating Voltage is 4.7V to 5.3V
* Current consumption is 1mA without backlight
* Alphanumeric LCD display module, meaning can display alphabets and numbers
* Consists of two rows and each row can print 16 characters.
* Each character is build by a 5×8 pixel box
* Can work on both 8-bit and 4-bit mode
* It can also display any custom generated characters
* Available in Green and Blue Backlight

1. **Relay:**

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof.

**Working Principle of Relay:**

It works on the principle of an electromagnetic attraction. When the circuit of the relay senses the fault current, it energies the electromagnetic field which produces the temporary magnetic field. This magnetic field moves the relay armature for opening or closing the connections

1. **BC 547 Transistor:**

The BC547 transistor is an NPN transistor. A transistor is nothing but the transfer of resistance which is used for amplifying the current. A small current of the base terminal of this transistor will control the large current of emitter and base terminals. The main function of this transistor is to amplify as well as switching purposes. The maximum gain current of this transistor is 800A.

**BC547 Transistor Pin Configuration:**

**Pin1 (Collector):** This pin is denoted with symbol ‘C’ and the flow of current will be through the collector terminal.

**Pin2 (Base):** This pin controls the transistor biasing.

**Pin3 (Emitter):** The current supplies out through emitter terminal.

**Precautions of this Transistor**

**The precautions of this transistor include the following.**

* To run the transistor for a long time in a circuit, it is very important that it doesn’t increase the load more than 100mA.
* The voltage should not exceed to 45V DC across the transistor.
* The base resistor should be used for providing the necessary current intended for saturation.
* Maintain the temperature from the above +150oC to -65 oC.
* Always verify the three terminals of the transistor while connecting in-circuit otherwise the performance can be reduced and the circuit can be damaged.

1. **Resistor:**

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses.