**Experiment 1**

**Objectives:**

1. To study hardware and software related to IoT

2. To understand the function of Node MCU, Arduino Uno and Raspberry Pi. **Arduino Board:**

An Arduino is actually a micro controller based kit. It is basically used in communications  and in controlling or operating many devices. Arduino UNO board is the most popular board  in the Arduino board family.

In addition, it is the best board to get started with electronics and coding. Some boards look a  bit different from the one given below, but most Arduino’s have majority of these components  in common.

It consists of two memories- Program memory and the data memory.

The code is stored in the flash program memory, whereas the data is stored in the data  memory.

Department of Computer Science & Engineering Page 17

Arduino Uno consists of 14 digital input/output pins (of which 6 can be used as PWM  outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an  ICSP header, and a reset button

1. Power USB Arduino board can be powered by using the USB cable from your computer.  All you need to do is connect the USB cable to the USB connection (1).

2. Power (Barrel Jack) Arduino boards can be powered directly from the AC mains power  supply by connecting it to the Barrel Jack (2).

3. Voltage Regulator The function of the voltage regulator is to control the voltage given to  the Arduino board and stabilize the DC voltages used by the processor and other elements.

4. Crystal Oscillator The crystal oscillator helps Arduino in dealing with time issues. How  does Arduino calculate time? The answer is, by using the crystal oscillator. The number  printed on top of the Arduino crystal is 16.000H9H. It tells us that the frequency is  16,000,000 Hertz or 16 MHz.

5,17.Arduino Reset You can reset your Arduino board, i.e., start your program from the  beginning. You can reset the UNO board in two ways.

 Most of the components used with Arduino board works fine with 3.3 volt and 5 volt.

• GND (8)(Ground) − There are several GND pins on the Arduino, any of which can be used  to ground your circuit.

• Vin (9) − This pin also can be used to power the Arduino board from an external power  source, like AC mains power supply.

10. Analog pins The Arduino UNO board has six analog input pins A0 through A5. These  pins can read the signal from an analog sensor like the humidity sensor or temperature sensor  and convert it into a digital value that can be read by the microprocessor.

11. Main micro controller Each Arduino board has its own micro controller (11). You can  assume it as the brain of your board. The main IC (integrated circuit) on the Arduino is  slightly different from board to board. The micro controllers are usually of the ATMEL  Company. You must know what IC your board has before loading up a new program from the  Arduino IDE. This information is available on the top of the IC. For more details about the IC  construction and functions, you can refer to the data sheet.

Power LED indicator This LED should light up when you plug your Arduino into a power  source to indicate that your board is powered up correctly. If this light does not turn on, then  there is something wrong with the connection.

14. TX and RX LEDs On your board, you will find two labels: TX (transmit) and RX  (receive). They appear in two places on the Arduino UNO board. First, at the digital pins 0  and 1, to indicate the pins responsible for serial communication. Second, the TX and RX led  (13). The TX led flashes with different speed while sending the serial data. The speed of  flashing depends on the baud rate used by the board. RX flashes during the receiving process.

15. Digital I/O

• The Arduino UNO board has 14 digital I/O pins

