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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
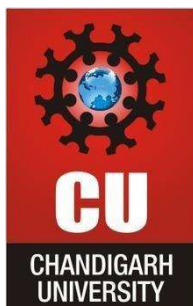
Submitted By:	Submitted To:
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Subject Name	Internet of Things Lab
Subject Code	20CSP-358
Branch	CSE
Semester	6

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Experiment- 1

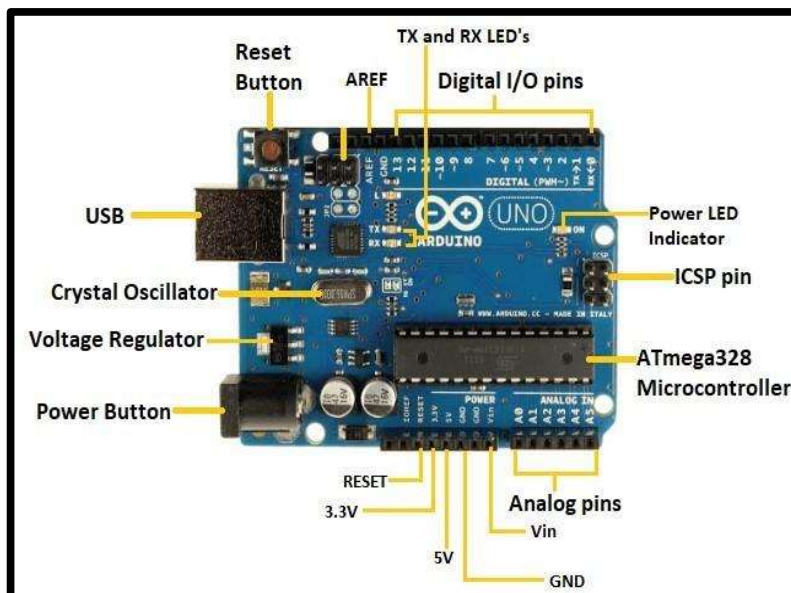|	
Name: Praduman Kumar	**UID:** 20BCS9446
Section: 714/A	**Date:** 17/02/2023
Branch: BE-CSE	**Subject:** IOT Lab

Aim:-

Familiarization with Arduino/Raspberry Pi hardware and perform necessary software installation.

Requirement Required:-

1. To study hardware and software related to IoT
2. To understand the function of Node MCU, Arduino Uno and Raspberry Pi.

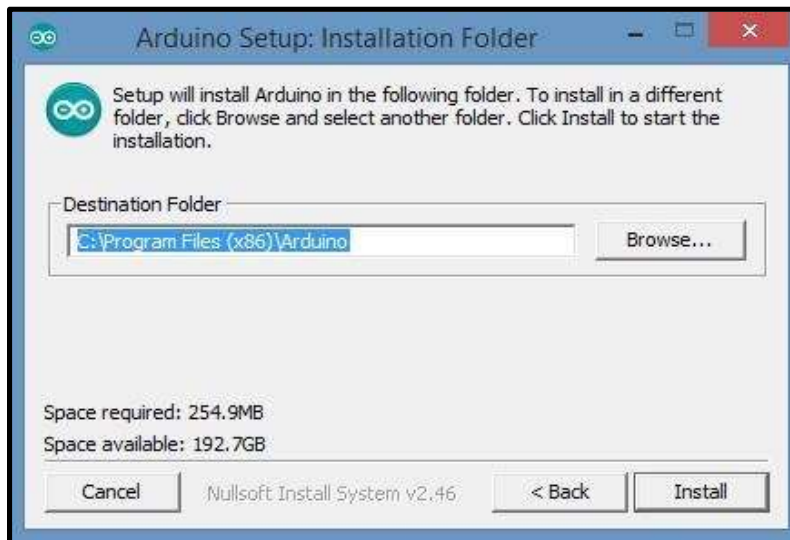## Arduino Board:-

Program an Arduino:

- The most important advantage with Arduino is the programs can be directly loaded to the device without requiring any hardware programmer to burn the program.
- This is done because of the presence of the 0.5KB of Boot-loader which allows the program to be burned into the circuit.

- All we have to do is to download the Arduino software and writing the code.
- The Arduino tool window consists of the toolbar with the buttons like verify, upload, new, open, save, serial monitor.
- It also consists of a text editor to write the code, a message area which displays the feedback like showing the errors, the text console which displays the output and a series of menus like the File, Edit, Tools menu.

Steps to program an Arduino:-

1. Programs written in Arduino are known as sketches. A basic sketch consists of 3 parts
   - Declaration of Variables
   - Initialisation: It is written in the setup () function.
   - Control code: It is written in the loop () function.

2. The sketch is saved with .ino extension. Any operations like verifying, opening a sketch, saving a sketch can be done using the buttons on the toolbar or using the tool menu.

3. The sketch should be stored in the sketchbook directory.

4. Chose the proper board from the tools menu and the serial port numbers.

5. Click on the upload button or chose upload from the tools menu. Thus the code is uploaded by the boot loader onto the micro controller.

1. Visit http://www.arduino.cc/en/main/software to download the latest Arduino IDE version for your computer's operating system. There are versions for Windows, Mac, and Linux systems.
   At the download page, click on the "Windows Installer" option for the easiest installation.

2. Save the .exe file to your hard drive.

3. Open the .exe file.

4. Click the button to agree to the licensing agreement.

5. Decide which components to install, then click "Next":

6. Select which folder to install the program to, then click "Install":

7. Now find the Arduino shortcut on your Desktop and click on it. The IDE will open up and you'll see the code editor

Pin Diagram in Arduino:

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.

Power (Barrel Jack)

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

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.

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.

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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. First, by using the reset button on the board. Second, you can connect an external reset button to the Arduino pin labelled RESET.

Pins (3.3, 5, GND, Vin)

```
3.3V — Supply 3.3

output volt 5V —

Supply 5 output

volt
```

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

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

```
Vin — This pin also can be used to power the Arduino board from
an external power source, like AC mains power supply.
```

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.

Main microcontroller

Each Arduino board has its own microcontroller. 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 microcontrollers 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.

ICSP pin

Mostly, ICSP is an AVR, a tiny programming header for the Arduino consisting of MOSI, MISO, SCK, RESET, VCC, and GND. It is often referred to as an SPI (Serial Peripheral Interface), which could be considered as an "expansion" of the output. Actually, you are slaving the output device to the master of the SPI bus.

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

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. 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.

Digital I/O

The Arduino UNO board has 14 digital I/O pins (of which 6 provide PWM (Pulse Width Modulation) output. These pins can be configured to work as input digital pins to read logic values (0 or 1) or as digital output pins to drive different modules like LEDs, relays, etc. The pins labelled "~" can be used to generate PWM.

AREF

AREF stands for Analog Reference. It is sometimes, used to set an external reference voltage (between 0 and 5 Volts) as the upper limit for the Analog input pins.
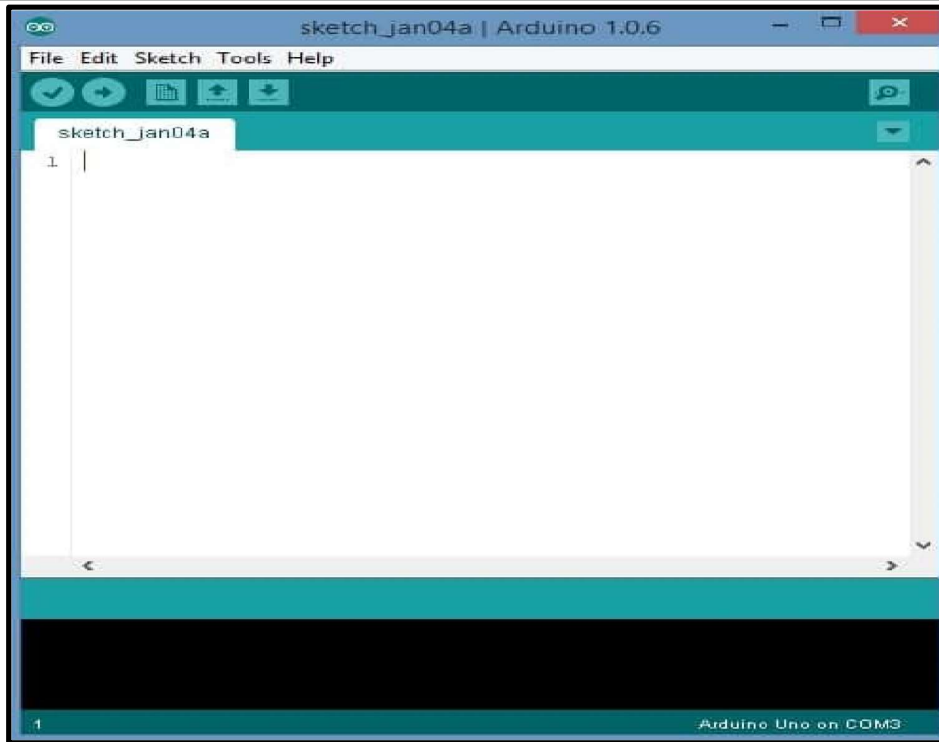
RASPERRY PI:
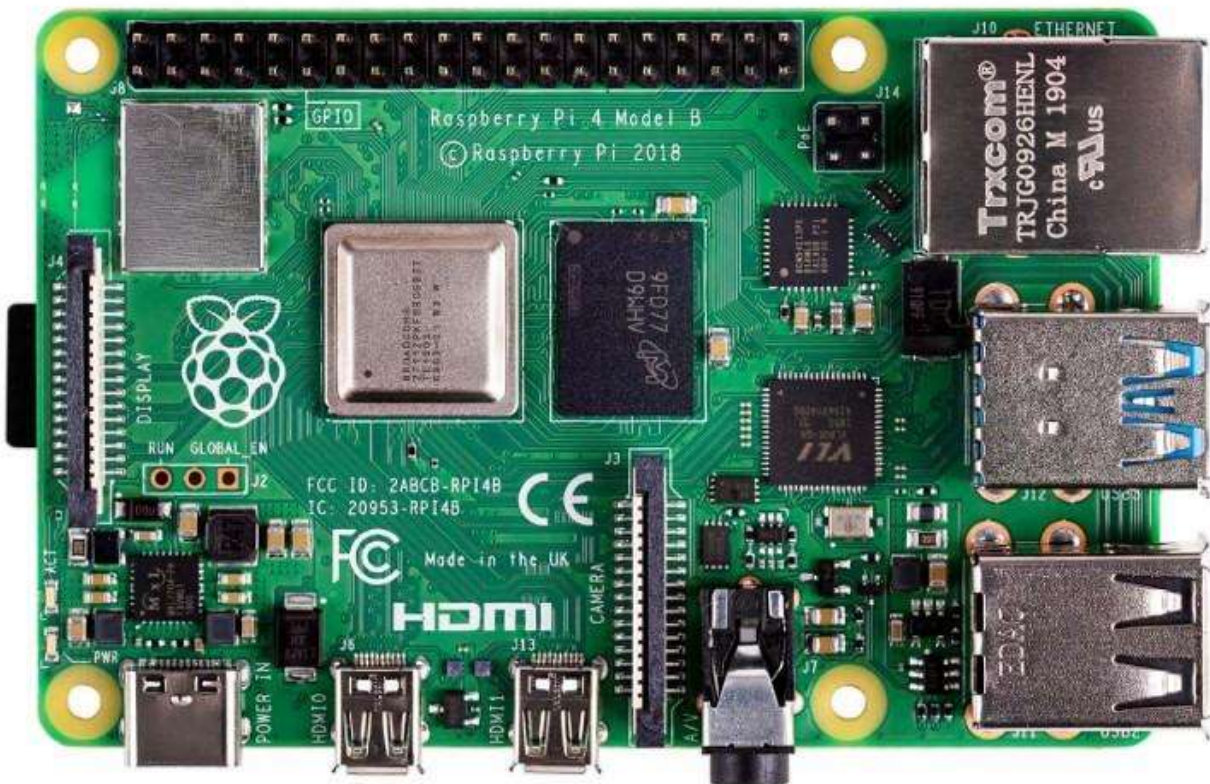
Program in Raspberry Pi:

Open Mu by going to Raspberry Pi Icon → Programming → Mu.

Click New in the menu bar to create an empty file.

Click Save in the menu bar.

Navigate to the /home/pi directory in the directory dropdown.

Click the Create New Folder icon in the top-right corner.

Name this new directory python-projects and hit Enter.

Click Cancel to close.

Downloading and Installing Raspberry Pi OS:

These steps should work on a using a Windows, Mac or Linux-based PC are as below:

1. Insert a microSD card / reader into your computer.
2. Download and install the official Raspberry Pi Imager.
3. Click Choose OS.
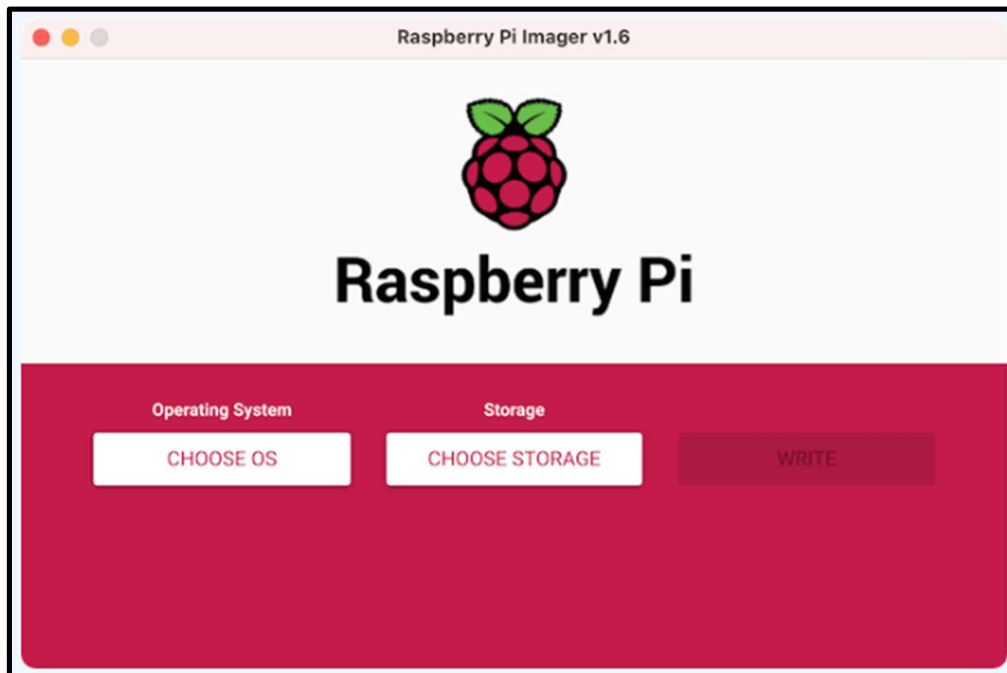
4.Click Choose storage and pick the SD card you're using.

5.Click Write. The app will now take a few minutes to download the OS & write to your card.

Raspberry Pi Imager v1.7.3

Raspberry Pi

Operating System: RASPBERRY PI OS (32-BIT)

Storage: GENERIC FLASH DISK USB DEVICE

WRITE