Sohag University
Faculty of Engineering

4th year Communication Dept.
Embedded Laboratory

LAB 1

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What's up !

- What is Raspberry pi?
- Hardware platform
- Software platform
- Intro to Python
- Getting started
- Hello World!

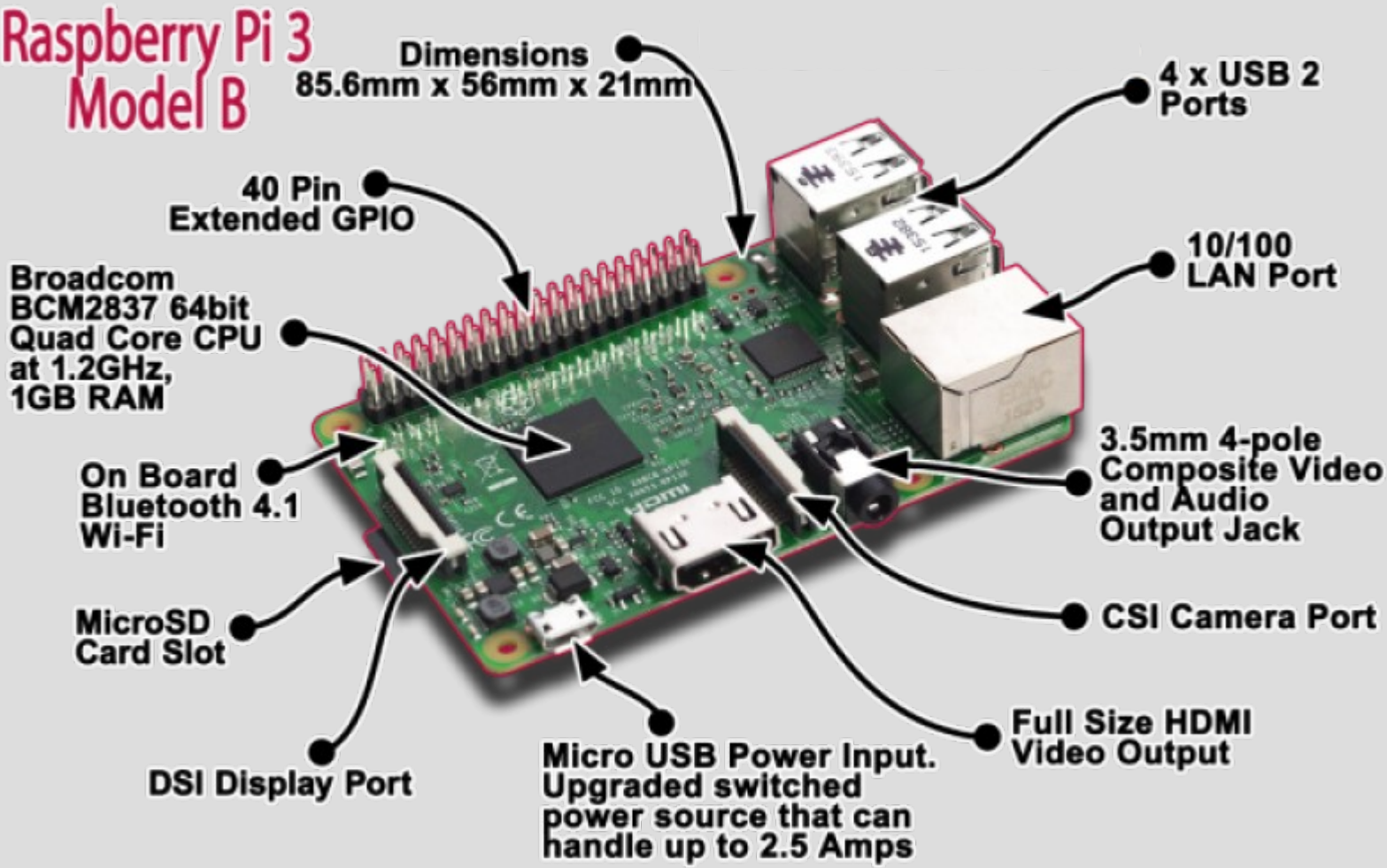
What is Raspberry pi?

- Full-featured credit-card sized computer on a single board
- Practical, portable and inexpensive ($35 or less)
- Based on Atmel ATmega644
- Officially launched in 2012
- Designed for education

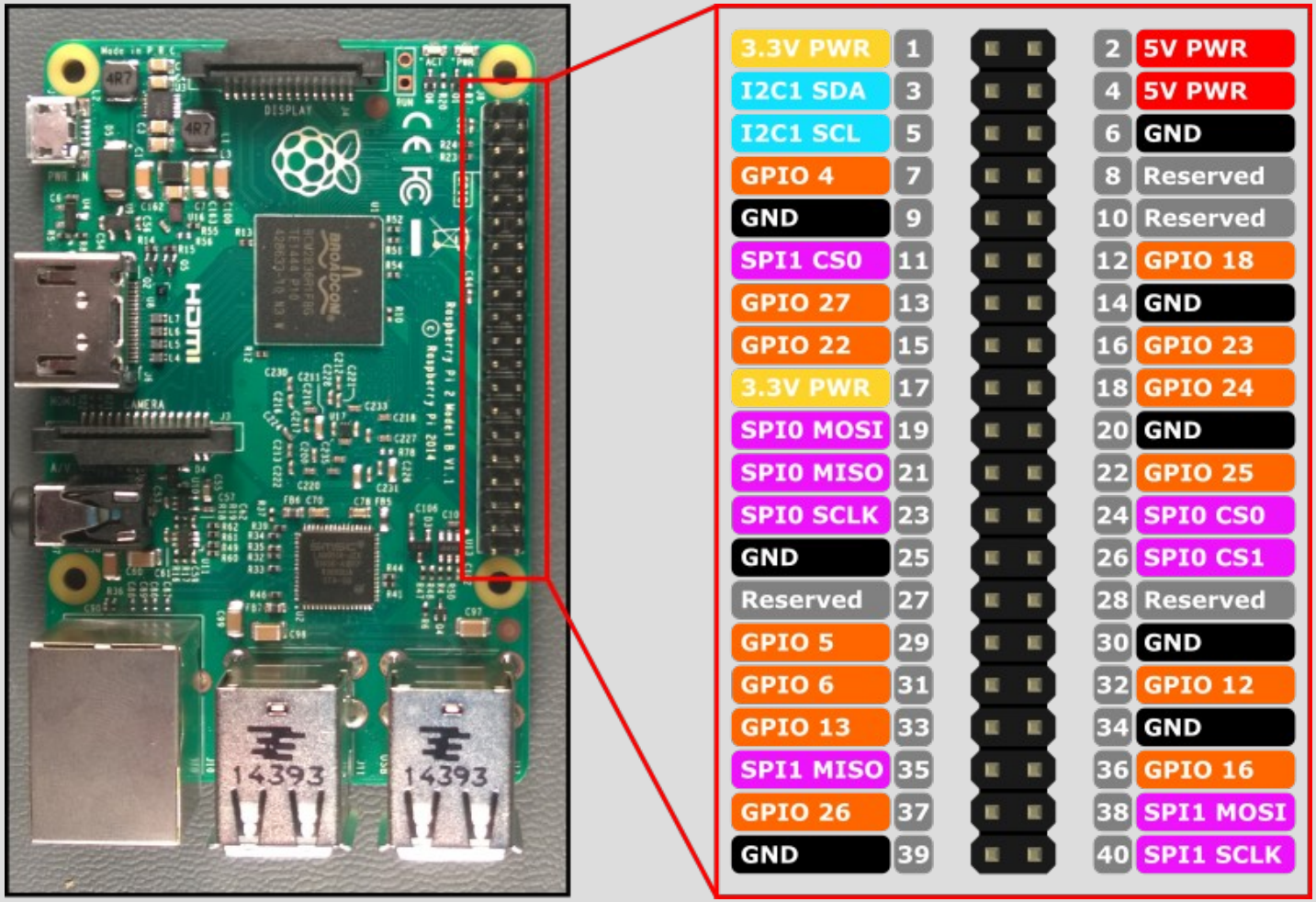
Hardware platform

- Raspberry Pi Zero ($5)
- Raspberry Pi
- Raspberry Pi 2
- Raspberry Pi 3 (with Wifi + Bluetooth, 35$)

Raspberry Pi 3 Model B



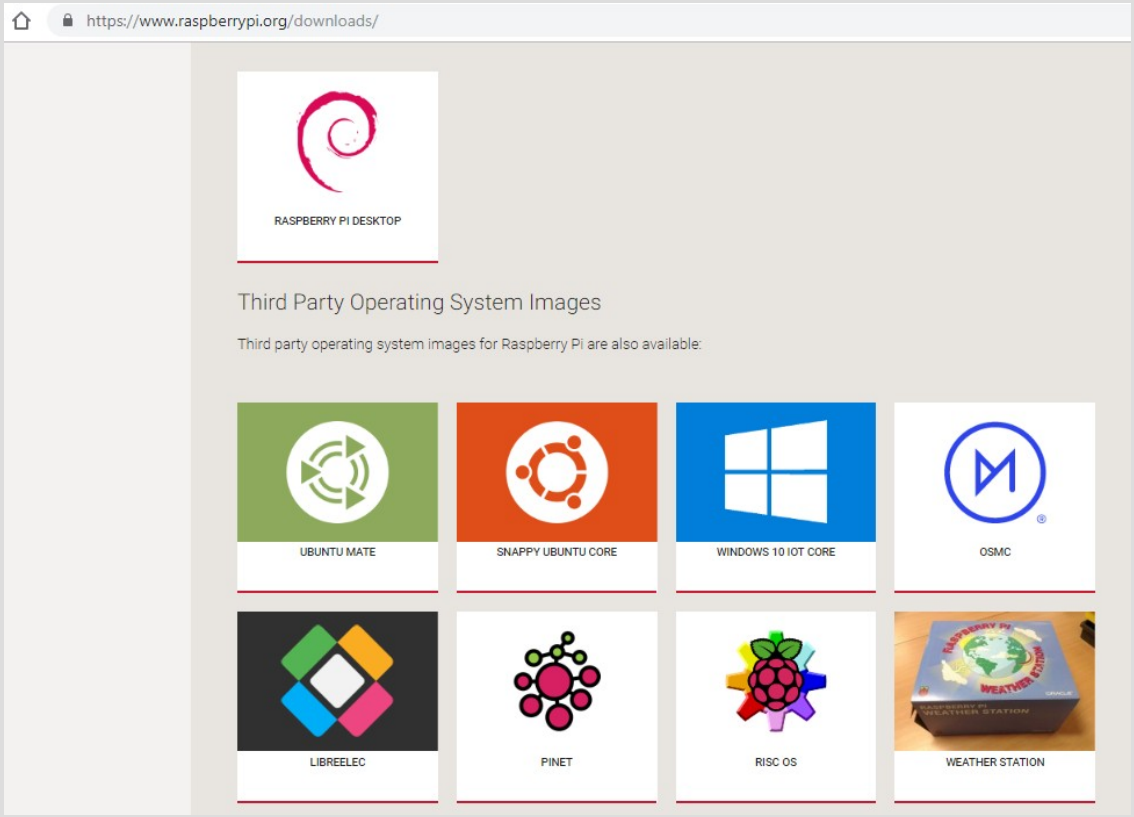
- RPi General Purpose IO (GPIO) Pins.
  - A 40-pin GPIO header is found on Raspberry Pi3 boards
  - Any of the GPIO pins can be designated (in software) as an input or output pin
  - the numbering of the GPIO pins is not in numerical order



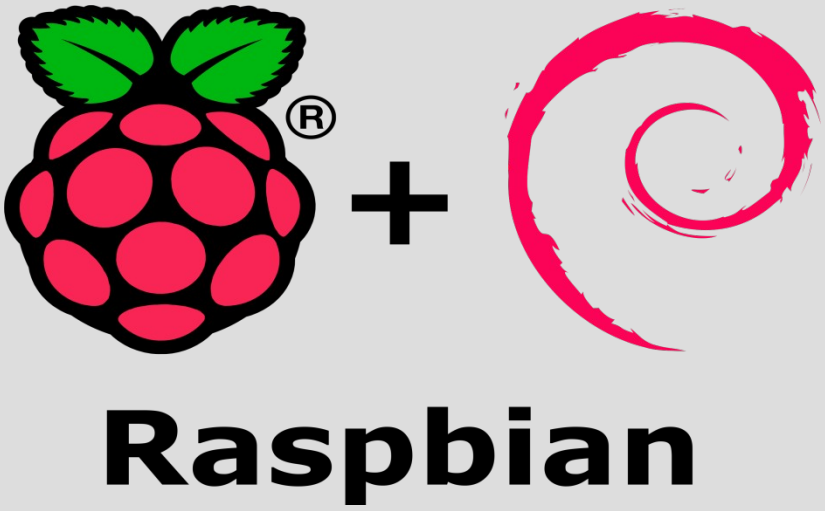
- RPi General Purpose IO (GPIO) Pins.
  - Voltages
    - Two 5V pins
    - two 3V3 pins
    - 8 ground pins (0V),
    - The remaining pins are all general purpose 3V3 pins,.
  - A GPIO pin designated as an output pin can be set to high (3V3) or low (0V).
  - A GPIO pin designated as an input pin can be read as high (3V3) or low (0V).
  - PWM (pulse-width modulation)
  - Software PWM available on all pins
  - Hardware PWM available on GPIO12, GPIO13, GPIO18, GPIO19
  - SPI
  - I2C
  - Data: (GPIO2); Clock (GPIO3)
  - TX (GPIO14); RX (GPIO15)

Software platform

- Many operating systems available
- Recommended operating systems are available to download from the Raspberry Pi website



- ***Raspbian*** is the official operating system of the Raspberry Pi Foundation



  - It's a free OS based on Debian Linux and optimized for the Raspberry Pi hardware.
  - It comes with a full GUI and a whole range of software installed

Intro to Python

- An interpreted, object-oriented, high-level, general-purpose and powerful programming language.
- Very clean syntax ... easy to Read and Write, Easy to fall in love with!
- Supports the use of modules and packages.
- Uses whitespace indentation, rather than curly brackets.

- Installation:
  - Linux always have Python installed by default
  - Or you can follow Python Download and Installation Instructions
  -
- How to run?
  - Python IDE (IDLE).
  - Executing Python files from the command line.

Getting started

- Make sure you have everything you need connected:
  - Mouse
  - Keyboard
  - Monitor or TV set
  - Micro SD card

- Installing operating system
  - Download the image from the Raspberry Pi website
    We are going to use Raspbian Jessie for this Lab.
  - Writing an image to the SD card
    By using Etcher, win32DiskImager or dd command for linux.
  - Insert the microSD card into the card slot on the underside of the Raspberry Pi

- Set up your Raspberry Pi
  - Plug the USB keyboard into one of the USB ports.
  - Plug the USB mouse into one of the USB ports
  - Turn on your monitor or TV set
  - Plug the HDMI or video component cable into the monitor or TV set.
  - Connect the other end of the cable into the Raspberry Pi.
  - Connect an Ethernet cable to your router if you plan to connect to the Internet.
  - Connect the power supply to the Raspberry Pi.

- OR Connect to the Raspberry Pi via SSH
  - Connect an Ethernet cable to your network
  - Find the RPI IP ifconfig command or ip scanner software (EX: ipscan24)
  - connect to RPI using SSH command or SSH client software (EX: PuTTy)

- GO ON!

Hello World!

- Start you first project
  - Conncet a Led to pin 37 (GPIO 26)
  - Get your hands dirty with code

pi@raspberrypi: ~/Documents/myProject

```
  GNU nano 2.2.6                                File: led.py

import RPi.GPIO as GPIO # Import Raspberry Pi GPIO library
from time import sleep # Import the sleep function from the time module

GPIO.setmode(GPIO.BCM)# or "GPIO.setmode(GPIO.BOARD)" to  Use physical pin numbering

GPIO.setup(26, GPIO.OUT, initial=GPIO.LOW) # Set pin 8 to be an output pin and set initial value to low (off)
print "Hello world!"
while True: # Run forever
        GPIO.output(26, GPIO.HIGH) # Turn on
        print "LED ON"
        sleep(1) # Sleep for 1 second
        GPIO.output(26, GPIO.LOW) # Turn off
        print "LED OFF"
        sleep(1) # Sleep for 1 second
```