

SNS COLLEGE OF TECHNOLOGY



Coimbatore-35

An Autonomous Institution

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DEPARTMENT OF MECHANICAL ENGINEERING 19MEB204 IoT FOR PRODUCTION SYSTEM

TOPIC - Raspbeery Pi





- The Raspberry pi is a single computer board with credit card size, that can be used for many tasks that your computer does, like games, word processing, spreadsheets and also to play HD video.
- It was established by the Raspberry pi foundation from the UK. It has been ready for public consumption since 2012 with the idea of making a low-cost educational microcomputer for students and children.
- The main purpose of designing the raspberry pi board is, to encourage learning, experimentation and innovation for school level students. The raspberry pi board is a portable and low cost.
- Maximum of the raspberry pi computers is used in mobile phones. In the 20th century, the growth of mobile computing technologies is very high, a huge segment of this being driven by the mobile industries. The 98% of the mobile phones were using ARM technology.





- The raspberry pi comes in two models, they are model A and model B. The main difference between model A and model B is USB port.
- Model A board will consume less power and that does not include an Ethernet port. But, the model B board includes an Ethernet port and designed in china.
- The raspberry pi comes with a set of open source technologies, i.e. communication and multimedia web technologies. In the year 2014, the foundation of the raspberry pi board launched the computer module, that packages a model B raspberry pi board into module for use as a part of embedded systems, to encourage their use.







Specifications

- The raspberry pi board comprises a program memory (RAM), processor • and graphics chip, CPU, GPU, Ethernet port, GPIO pins, Xbee socket, UART, power source connector. And various interfaces for other external devices.
- It also requires mass storage, for that we use an SD flash memory card. ٠ So that raspberry pi board will boot from this SD card similarly as a PC boots up into windows from its hard disk.





- Essential hardware specifications of raspberry pi board mainly include SD card containing Linux OS, US keyboard, monitor, power supply and video cable.
- Optional hardware specifications include USB mouse, powered USB hub, case, internet connection, the Model A or B: USB WiFi adaptor is used and internet connection to Model B is LAN cable













- Memory
- The raspberry pi model A board is designed with 256MB of SDRAM and model B is designed with 51MB.Raspberry pi is a small size PC compare with other PCs.
- The normal PCs RAM memory is available in gigabytes.
- But in raspberry pi board, the RAM memory is available more than 256MB or 512MB





- CPU (Central Processing Unit)
- The Central processing unit is the brain of the raspberry pi board and that is responsible for carrying out the instructions of the computer through logical and mathematical operations.
- The raspberry pi uses ARM11 series processor, which has joined the ranks of the Samsung galaxy phone.





- GPU (Graphics Processing Unit)
- The GPU is a specialized chip in the raspberry pi board and that is designed to speed up the operation of image calculations.
- This board designed with a Broadcom video core IV and it supports OpenGL





- Ethernet Port
- The Ethernet port of the raspberry pi is the main gateway for communicating with additional devices.
- The raspberry pi Ethernet port is used to plug your home router to access the internet.





- GPIO Pins
- The general purpose input & output pins are used in the raspberry pi to associate with the other electronic boards.
- These pins can accept input & output commands based on programming raspberry pi. The raspberry pi affords digital GPIO pins.
- These pins are used to connect other electronic components.
- For example, you can connect it to the temperature sensor to transmit digital data.





- XBee Socket
- The XBee socket is used in raspberry pi board for the wireless communication purpose.
- The power source cable is a small switch, which is placed on side of the shield.
- The main purpose of the power source connector is to enable an external power source.





- UART
- The Universal Asynchronous Receiver/ Transmitter is a serial input & output port.
- That can be used to transfer the serial data in the form of text and it is useful for converting the debugging code.





- Display
- The connection options of the raspberry pi board are two types such as HDMI and Composite.
- Many LCD and HD TV monitors can be attached using an HDMI male cable and with a low-cost adaptor.
- The versions of HDMI are 1.3 and 1.4 are supported and 1.4 version cable is recommended. The O/Ps of the Raspberry Pi audio and video through HMDI, but does not support HDMI I/p.
- Older TVs can be connected using composite video.
- When using a composite video connection, audio is available from the 3.5mm jack socket and can be sent to your TV.
- To send audio to your TV, you need a cable which adjusts from 3.5mm to double RCA connectors.





Model A Raspberry Pi Board

- The Raspberry Pi board is a Broadcom(BCM2835) SOC(system on chip) board. It comes equipped with an ARM1176JZF-S core CPU, 256 MB of SDRAM and 700 MHz,. The raspberry pi USB 2.0 ports use only external data connectivity options. The board draws its power from a micro USB adapter, with min range of 2. Watts (500 MA).
- The graphics, specialized chip is designed to speed up the operation of image calculations.
- This is in built with Broadcom video core IV cable, that is useful if you want to run a game and video through your raspberry pi.







- Features of Raspberry PI Model A
- The Model A raspberry pi features mainly includes
- 256 MB SDRAM memory
- Single 2.0 USB connector
- Dual Core Video Core IV Multimedia coprocessor
- HDMI (rev 1.3 & 1.4) Composite RCA (PAL and NTSC) Video Out
- 3.5 MM Jack, HDMI, Audio Out
- SD, MMC, SDIO Card slot on board storage
- Linux Operating system
- Broadcom BCM2835 SoC full HD multimedia processor
- 8.6cm*5.4cm*1.5cm dimensions



Model B Raspberry pi Board



- The Raspberry Pi is a Broadcom BCM2835 SOC (system on chip board). It comes equipped with a 700 MHz, 512 MB of SDRAM and ARM1176JZF-S core CPU.
- The USB 2.0 port of the raspberry pi boars uses only external data connectivity options.
- The Ethernet in the raspberry pi is the main gateway to interconnect with other devices and the internet in model B.
- This draws its power from a micro USB adapter, with a minimum range of 2.5 watts(500 MA).
- The graphics, specialized chip is designed to speed up the manipulation of image calculations.
- This is in built with Broadcom video core IV cable, that is useful if you want to run a game and video through your raspberry pi.





Raspberry Pi 3 Model B <u>illillillillilli</u>

Model B Raspberry pi Board

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- Features of Raspberry PI Model B
- 512 MB SDRAM memory
- Broadcom BCM2835 SoC full high definition multimedia processor
- Dual Core Video Core IV Multimedia coprocessor
- Single 2.0 USB connector
- HDMI (rev 1.3 and 1.4) Composite RCA (PAL & NTSC) Video Out
- 3.5 MM Jack, HDMI Audio Out
- MMC, SD, SDIO Card slot on board storage
- Linux Operating system
- Dimensions are 8.6cm*5.4cm*1.7cm
- On board 10/100 Ethernet RJ45 jack





- To Set Up & Start your Raspberry Pi
- The Raspberry Pi board comes equipped with an SD card. This slot permits us to insert an SD card and that can use it as our devices.
- The SD card is a main storage device for raspberry pi board like a hard disk of a personal computer.
- The bootable Linux operating system is loaded onto the card, you are planning to use. The raspberry pi supports Linux, Qtonpi, ARM, Mac operating systems.
- You can select one OS; you will need to write it to an SD card using a Disk manager application. You can also use other storage mechanism, like USB external hard drive or USB drive.
- There are a numerous brands of SD cards are available in the market in different sizes. The raspberry pi supports max 64 GB SD card.





Before you start your raspberry pi, you are going to need to connect a display, keyboard,mouse like as a PC.

- It supports three different O/Ps like HDMI video, composite video, and DSI video, where the DSI video needs some specific hardware.
- When you buy a raspberry pi board it may sold with or without an SD card. It is a very important specification in raspberry pi board. Because, it keeps its operating system, documents and programs.
- If your raspberry pi did not come with an SD card, then the min size you should get is 4GB.
 - Advantages of the raspberry pi is, it is small in size, and it works as a normal computer at low cost server to handle web traffic.





- Applications of Raspberry Pi
- The raspberry pi boards are used in many applications like
- Media streamer
- Arcade machine
- Tablet computer
- Home automation
- Carputer
- Internet radio
- Controlling robots
- Cosmic Computer
- Hunting for meteorites, Coffee and also in raspberry pi based projects.





- The Raspberry Pi device looks like a motherboard, with the mounted chips and ports exposed (something you'd expect to see only if you opened up your computer and looked at its internal boards), but it has all the components you need to connect input, output, and storage devices and start computing.
- You'll encounter two models of the device: Model A and Model B. The only real differences are the addition of <u>Ethernet</u> and an extra USB port on the more expensive Model B.
- Here are the various components on the Raspberry Pi board:
- ARM CPU/GPU -- This is a Broadcom BCM2835 System on a Chip (SoC) that's made up of an ARM central processing unit (CPU) and a Videocore 4 graphics processing unit (GPU). The CPU handles all the computations that make a computer work (taking input, doing calculations and producing output), and the GPU handles graphics output.
- GPIO -- These are exposed general-purpose input/output connection points that will allow the real hardware hobbyists the opportunity to tinker.
- RCA -- An RCA jack allows connection of analog TVs and other similar output devices.
- Audio out -- This is a standard 3.55-millimeter jack for connection of audio output devices such as headphones or speakers. There is no audio in.





- LEDs -- Light-emitting diodes, for all of your indicator light needs.
- USB -- This is a common connection port for peripheral devices of all types (including your mouse and keyboard). Model A has one, and Model B has two. You can use a USB hub to expand the number of ports or plug your mouse into your keyboard if it has its own USB port.
- HDMI -- This connector allows you to hook up a high-definition television or other compatible device using an HDMI cable.
- Power -- This is a 5v Micro USB power connector into which you can plug your compatible power supply.
- SD cardslot -- This is a full-sized SD card slot. An SD card with an operating system (OS) installed is required for booting the device. They are available for purchase from the manufacturers, but you can also download an OS and save it to the card yourself if you have a Linux machine and the wherewithal.
- Ethernet -- This connector allows for wired network access and is only available on the Model B.
- Many of the features that are missing, such as <u>WiFi</u> and audio in, can be added using the USB port(s) or a USB hub as needed











Downloading and Installing Raspberry Pi OS

Once you have all the components you need, use the following steps to set up your Raspberry Pi using a Windows, Mac or Linux-based PC (we tried this on Windows, but it should be the same on all three).

1. Insert a microSD card / reader into your computer.

2. Download and install the official Raspberry Pi Imager. Available for Windows, macOS or Linux, this app will both download and install the latest Raspberry Pi OS. There are other ways to do this, namely by downloading a Raspberry Pi OS image file and then using a third-party app to "burn it," but the Imager makes it easier.

3. Click Choose OS and select Raspberry Pi OS (32-bit) from the OS menu (there are other choices, but for most uses, 32-bit is the best).







Click Choose OS in Raspberry Pi Imager (Image credit: Raspberry Pi Imager)

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	Operating System	Х
ŏ	Raspberry Pi OS (32-bit) A port of Debian with the Raspberry Pi Desktop (Recommende Released: 2021-05-07 Cached on your computer	ed)
8	Raspberry Pi OS (other) Other Raspberry Pi OS based images	>
<u></u>	Other general purpose OS Other general purpose Operating Systems	>
Ø	Media player - Kodi OS Kodi based Media player operating systems	>
¢.	Emulation and game OS	>





4. Click Choose SD card and pick the one you're using.



21.01.2021





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







1. Click Next on the dialog box and then select your country, language and keyboard type.

		Welcome to Raspberry Pi 🛛 🗕 🗖	×
elater	Set Country		and the second se
	Enter the detail time zone, keyb	s of your location. This is used to set the language board and other international settings.	
	Country:	United States	-
-	Language:	American English	-
	Timezone:	New York	-
		☑ Use US keyboa	ard
	Press 'Next' wh	en you have made your selection.	14 1 m
	Back	Next	1 144

21.01.2021





2. Change your default password on the next screen or leave it blank for it remain as "raspberry."







3. Select the appropriate Wi-Fi network on the screen after, provided that you are connecting via Wi-Fi. If you don't have Wi-Fi or are using Ethernet, you can skip this.

Select your WiFi network from the list.	
FIOS-CODNB	
	Ŷ
FIOS-K1ZWG	-
Linksys12545	21
Linksys12545-guest	¥ !
Moore5	7.





4. **Click Next** when prompted to Update Software. This will only work when you are connected to the Internet, and it can take several minutes. If you are not connected to the Internet, click Skip.

Welcome to Rasp	b VQ 🖇	()	21 %	09:25	¢
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Press 'Next' to check and update so without checking.	oftware, or 'Ski	p' to conti	nue		
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21.01.2021





5. Click Done or Reboot (if prompted to reboot).

































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