Design Document: Build Your Own Desktop PC – Part 1

Class Description

Learn how to build your own computer and perform basic computer repairs in this three-part, hands-on series.

**Curriculum Track**

Software & Apps

**Audience**

Adults, Teens ages 14 and up

**Course Length**

90 minutes

**Training Method**

Lecture/Demo

**Purpose**

To inform customers on how to identify individual computer parts and purchase them for the purposes of building or refurbishing a computer.

Equipment Requirements

Projection screen, projector, teacher computer for presentation, computers for display/take-a-part

Software Requirements

Windows 7 or above

**Material Requirements**

PowerPoint presentation, handout, participant surveys, paper and pencil

**Learning Objectives**

At the end of the session, learners will be able to:

* Name of all of the parts in a computer
* Make informed decisions about what computer parts will be right for their computer
* Identify what operating system is right for them
* Identify what peripherals are right for them
* Name stores to buy parts from
* Identify the best brands
* Identify where to buy used parts
* Know how to plan for future upgrades

**Assessment Technique(s)**

Question and answer

Content Outline

(🡪) Designates to move to the next power point slide

***Prep (15-20mins.)***

* Load the Powerpoint file
* Open your web browser and access [Newegg](http://www.newegg.com/), [Amazon](http://www.amazon.com), [Passmark](https://www.passmark.com/), and a [PSU calculator](http://outervision.com/power-supply-calculator)
  + Have intel and AMD motherboards ready for examples
* Bring in and pre disassemble a computer to show people parts. Have an assembled computer next to it as reference.

***Opening Remarks (1-2 mins.)***

* Explain how this class is a 3-part class and today we will be setting the stage and taking notes. Next class we will spend the entire time with hands on so paying attention and learning the parts is very important.

***Agenda (2-3 mins.)***

* What are you looking for in a desktop PC?
* Computer Parts
* Operating system
* Peripherals
* Purchasing
* Trusted Brands
* Buying Used
* Upgrading 🡪

***What are you looking for in a desktop PC? (5 mins.)***

* The first step before buying or looking at any computer parts is to think about the purpose of building a computer.
  + Are you building a family computer, work station, gaming computer, internet browsing, media center, audio and video editing station, or a school computer?
  + Consider the other following aspects of a computer
    - Price
    - Size
    - Speed/Performance
    - Noise Levels
    - Aesthetics 🡪
* Explain the terminology you are going to be using throughout the presentation to explain different types of computer users and the parts/costs they types will need
* Light users: Most people who just search the web, watch video, do emails, etc.
* Moderate users: People who do have high resolution display or multiple displays, light photo, video, and sound editing, plays some video games.
* Plays the latest video games, runs programs such as auto CAD or other engineering software, is a heavy video/photo/sound editor.
* Explain to students that you can mix and match these parts depending on what you want. Example: If you want the fastest computer that will last a long time, but do not play video games you can get a power user CPU and Hard drive, but get light user parts for everything else.🡪

***Computer Parts (45 mins.)*** *Note: When talking about specific parts pass an example around for people to see, and/or show an example on Newegg.*

* **Computer Cases:**
  + Talk about the differences of each different case and explain that the case will decide how many and what components will fit in your machine.
    - Most standard computer cases since the 90’s follow the same standards. Because of this new computer parts usually fit in old cases.
    - Mini- ITX
    - ATX mini
    - ATX mid
    - ATX Full tower
    - ATX Super tower
  + Besides size you should choose a case based off of the following questions
    - Does it have enough room for the components I want?
    - Will it be large enough for future upgrades?
    - Do I think it looks good?
    - Will it fit in the location I want to place it at home?
    - Price
  + Remember your computer case designates everything else you purchase. Remember what size components your case can handle and purchase accordingly. 🡪
  + You can always get creative and create your own case 🡪
* **CPU/APU**
  + Explain that this is the most important part of your computer which will determine many of the other parts you will purchase and upgradability.
  + CPU = Central processing unit: Main processor that runs everything in your computer
  + APU= Accelerated Processing unit: Just like a CPU except it includes a graphics processor on the chip
    - Cores: More cores = faster, better at multitasking
      * Minimum purchase: 2 cores, preferred 4 or more.
    - In today’s day and age GHZ means almost nothing
    - [www.cpubenchmark.net](http://www.cpubenchmark.net)
      * For basic web browsing and emailing a score of 3000+ is more than enough
      * For long term use a score of 5000+ should last 4-6 years
      * For high workloads, gaming and longest longevity, a score of 8000+ is ideal 🡪
* **Motherboard**
  + There are two main Motherboards an AMD or Intel compatible board.
    - When choosing a board make sure to pick a board that is compatible with the brand and socket of your CPU/APU
    - Go to Newegg website and show examples of types of motherboards
  + Next you need to pick a board that is will fit in your computer case. Check the specifications of your case and purchase a board that will fit in it.
    - ATX, Micro ATX, Mini ITX, uATX, or Extended ATX
  + Getting a more expensive motherboard will not increase performance or longevity. Get a good brand. Purchase based off of features, and compatibility with your CPU and case. 🡪
* **Motherboard Features**
  + Define and explain the expansion slots
    - Sata: Allows you to add more Harddrives and optical drives (DVD/CD/Blu-Ray)
    - PCI slots allow for extra add on such as GPUs, wireless cards, audio cards, etc.
  + Finally think about upgrades and other hardware. If you are going to add a wireless card, graphics card, audio card, more ram, etc. Make sure you have slots on your motherboard to accommodate them.
  + If you purchase an APU to utilize the graphics make sure the motherboard has HDMI, DVI, or Display Port out option.
  + Finish up by explaining that having extra PCI, SATA, and RAM slots will allow you to upgrade more easily in the future. 🡪
* **GPU**
  + GPU= Graphics Processing Unit
  + If you have an APU and are not using a 4K display, gaming, 3D modeling you are fine without one.
  + If you are gaming purchasing the best card for your money is important. The greatest value per dollar is around the $150-200 range. This will last you about 4 years.
    - You can always buy a second card later if your motherboard supports it
  + If you are working with video editing, 3d modeling, etc. get a work station card. Before buying a workstation card look up your software and what kind of card it recommends.
  + AMD vs Nvidia
    - Both are great companies and make great products
    - On Average you get more power for your money with AMD
    - Nvidia has the most powerful cards Nvidia Titan, 980ti, etc. 🡪
* **RAM**
  + RAM= Random Access Memory: Ram is memory used to run programs, keep internet tabs up, play games, etc. The more you have running at once the more RAM you need.
  + Right now there is DDR3(old) DDR4(new). You will only see a difference in performance if you have an APU.
    - If your motherboard supports it get DDR 4 to save money get DDR 3
  + Minimum ram for Windows 10 and internet browsing is 4 gigs.
    - Recommended to get 8 gigs or more
  + RAM will be labeled by speed when purchasing. The difference in performance from this is not noticeable unless you have an APU. In this case get the fastest rated RAM you can afford. Amount of RAM in GB is more important than speed. 🡪
* **Hard Drives**
  + 3 Types of Drives
    - Mechanical Hard Drive(standard): Large sizes for low prices, but is slow
    - SSD = Solid State Drive: Very fast speeds expensive for large size
    - Hybrid Drive: Half Mechanical half SSD. Faster speeds with lower cost for storage
  + If you need to store a lot of files get a standard or hybrid hard drive
  + If you want fast speed with little storage get an SSD
  + If you want the best of both worlds buy an SSD to install Windows and programs on and get standard drive for storage. 🡪
* **Optical Drives - DVD/Blu-ray drives**
  + Most software can be downloaded from the internet so an optical drive is not needed.
  + If you are going to burn CDs, DVDs, or Blu-rays, or use old software get an optical drive that supports your needs. 🡪
* **Cooling Fans**
  + Most computer just need one fan pushing in cool air
  + Higher end computers should have 2 or more fans
  + For quiet running computes get fans rated at 17dBs or less
  + Not all cases can fit any size fan. Looks up what fan sizes can fit in your case and buy those.
    - Typical sizes are 92, 120, 140, and 200mm
    - 120mm will fit in 99% of cases
  + Many fans come with LEDs, so make sure to pick a good aesthetic choice if you go that route 🡪
  + Best Configuration
    - Cold air intake in the front
    - Have the top case fans pushing out hot air 🡪
* **PSU**
  + PSU=Power Supply Unit
  + Add up the wattage of all of your items and get a PSU that has more watts then that
  + If you plan on upgrading in the future get a PSU with more wattage, then you need 🡪
  + If you are getting a graphics card, make sure your PSU has the necessary power cords to power it as well as the correct amps on the 12-volt rail
  + Never buy a cheap PSU from an Untrusted brand! Cheap power supplies provide inconsistent power that can burn out prematurely and/or damage your computer. 🡪
* **Alternative Options: Bare Bones**
  + This option is a case that already has a power supply, fan and a motherboard preinstalled.
  + This is a good beginning for a new computer builder. This can also be a way to save money
  + If you want a very small computer this is a great way to go. The smallest computers are almost always barebones computers. 🡪

**Operating Systems (5-7 mins.)**

* **Windows**
  + For the longest security support and best software support purchase Windows 10
  + If you prefer Windows 7 or 8 keep in mind the security updates and when they end. 🡪
* **Linux**
  + For a free alternative to Windows try Linux
  + The best versions are
    - Mint
    - Ubuntu
    - Chrome OS
    - Lumbuntu
  + There are many more Linux distributions then those 4 feel free to investigate and look for one that suites your specific needs.
* You cannot legally install Mac OSX on a home built computer 🡪

**Peripherals (10 mins.)**

* **Display**
  + TV and Monitors are pretty similar now a days. Either can be used with a computer.
    - TV pros
      * Larger screen
      * Cheaper
      * Speakers
      * Multi use
    - Monitor Pros
      * Better image quality
      * Better colors
      * Higher frame rates
      * Better response times
      * Usually adjustable
  + When buying a display consider the following
    - Contrast: The difference in color between the darkest and lightest colors. The higher this color the truer to real life colors are. Very important for photo editing
    - Screen size: something that will be comfortable for the distance you are from the screen. Personal preference
    - Input: Make sure the display is compatible with the output of your computer such as HDMI, DVI, DP or VGA
    - LCD vs LED vs IPS
      * IPS has the most vibrant colors but uses more electricity and has a slower response rate
      * LED has the fastest response rate and the lowest energy consumption
      * LCD standard display used by most devices average all around
    - Refresh rate: The time between you making an action and it showing up on screen. 10ms is not noticeable by most human eyes. 🡪
* **Mouse and Keyboard**
  + Testing a mouse and keyboard at a store like Fry’s is the best bet way to know if you will like it. Comfort is the most important part of a mouse and keyboard
  + Things to consider when buying a Mouse
    - Wireless or wired?
    - Size to fit your hands
  + Things to consider when buying a keyboard
    - Wireless or Wired?
    - Full size or small keyboard
    - Included USB ports?
    - Back lighting?
    - Type of keys
      * Standard dome: plastic domes that touch a circuit board most keyboards are this type
      * Small profile keys: Dome keyboards with very shallow keys similar to a laptop keyboard
      * Mechanical: Mechanical switches that are full size. Usually click and need very light pressure to press. Preferred by gamers and heavy typers for speed and less fatigue. 🡪
* **Sound**
  + Cheap Standard 2.0 speakers or those built into the display are fine for most people
  + For best sound look for 3.1 or 5.1 speakers around $75-100 or up
  + If you live with people, consider getting a headset for the best audio quality without bugging anyone.
  + Best Mic brands are Blue, Audio-Technica, Sony and Logictech is a good budget brand 🡪

**Purchasing (5 mins.)**

* Best physical store is Fry’s Electronics. It will have everything plus they price match, have friendly staff that knows their stuff, have products to touch and test, and they have a massive selection. 🡪
* Another great store is Micro Center. They are farther away than Fry’s but are similar in experience and quality. Large selection, helpful staff, price matching, etc. 🡪
* Best online retailers
  + Amazon: Good prices, customer service, and helpful reviews
  + New Egg: Good prices, fast shipping, reviews by tech people, and great customer service 🡪

**Trusted Brands (5 mins.)**

* **Favorite Brands**
  + Asus: Arguably the best company on the market
  + Gigabyte: Some of the best products on the market
  + MSI: Personal favorite. Great products and great customer support
  + Kingston: Great midrange products with nice warranties
  + Corsair: Great mid-range brand with dependable products
  + Adata: Cheaper and reliable brand
  + Western Digital: Best mechanical hard drives
  + EVGA: Great products, great quality
  + XFX: Good midrange price and quality
  + Zotc: Good midrange price and quality 🡪
* **Less Reliable Brands**
  + Patriot
  + (ECS) Elite-Group
  + Biostar
  + Leapr
  + Logisys
  + Super Talent
  + Or anything you never heard of
* If you are interested in one of these products make sure they have a decent warranty and look to see the reviews. 🡪

**Buying Used (5 mins.)**

* Warning for new builders – avoid used items except those in the recommended list
* Pros of buying used parts
  + Cheaper
  + Still great condition
  + Get better parts for the same price as new slower parts
  + Can purchase refurbished parts off Newegg for lower price, but still has a warranty
* Cons
  + Poor condition
  + Don’t know how they were treated before you got the item
  + Don’t know how much life is left in the item
  + Scams
  + Hard drives with viruses pre-installed do not purchase used! 🡪

**Questions (3 mins.)**

* Ask for questions.
* Remind the class that next week we are going to be doing all hands on
  + Computers and Tools will be provided. Wear clothes than can get dusty.