FUNDAMENTALS OF INFORAMTIONS AND TECHNOLOGY

Module 1: Looking at Computers: Understanding the Parts

Module topics are:

- Functions of a computer
- Data versus information
- Bits and bytes
- Input devices
- Output devices
- Processing
- Storage
- Ergonomics

Computers Are Data Processing Devices

Strictly defined, a computer is a data processing device that performs four major functions:

1. It **gathers** data (or allows users to input data).
2. It **processes** that data into information.
3. It **outputs** data or information.
4. It **stores** data and information.

Data vs. Information

- **Data is a representation of a fact, figure, or idea**.
- **Information is data that has been organized or presented in a meaningful fashion.**

Bits and Bytes: The Language of Computers

- **Bit**

• In order to process data into information, computers need to work in a language they understand. This language, called **binary language**, consists of just two digits: 0 and 1.

• Everything a computer does is broken down into a series of 0s and 1s. Each 0 and 1 is a binary digit, or bit for short.

- **Byte**

• Eight binary digits (or bits) combine to create 1 byte.

- **In computers, each letter of the alphabet, each number, and each special character (such as the @ sign) consists of a unique combination of 8 bits, or a string of eight 0s and 1s.**

How Much Is a Byte?

- Not only are bits and bytes used as the language that tells the computer what to do, they are also what the computer uses to represent the data and information it inputs and outputs.
- Kilobytes, megabytes, and gigabytes are therefore simply amounts of bytes.

Name	Abbreviation	Number of Bytes	Relative Size
Byte	B	1 byte	Can hold one character of data.
Kilobyte	kB	1,024 bytes (2^{10} bytes)	Can hold 1,024 characters or about half of a double-spaced typewritten page.
Megabyte	MB	1,048,576 bytes (2^{20} bytes)	Can hold approximately 768 pages of typed text.
Gigabyte	GB	1,073,741,824 bytes (2^{30} bytes)	Approximately 786,432 pages of text; 500 sheets of paper is approximately 2 inches, so this represents a stack of paper 262 feet high.
Terabyte	TB	1,099,511,627,776 bytes (2^{40} bytes)	This represents a stack of typewritten pages almost 51 miles high.
Petabyte	PB	1,125,899,906,842,624 bytes (2^{50} bytes)	The stack of pages is now 52,000 miles high, or approximately one-fourth the distance from the Earth to the moon.
Exabyte	EB	1,152,921,504,606,846,976 bytes (2^{60} bytes)	The stack of pages is now 52 million miles high, or just about twice the distance between the Earth and Venus.
Zettabyte	ZB	1,180,591,620,717,411,303,424 bytes (2^{70} bytes)	The stack of pages is now 52 billion miles high, some 20 times the distance between the Earth and Pluto.

Computer Hardware

- **Hardware: Any part of the computer you can touch.**
- Hardware components consist of the system unit and peripheral devices, such as monitors and printers that are connected to the computer.
- Other hardware devices, such as routers, help a computer communicate with other computers to facilitate sharing documents and other resources.
- Together, the system unit and peripheral devices perform four main functions: they enable the computer to input data, process that data, and output and store the data and information.

Computer Software

- Software is the set of computer programs that enables the hardware to perform different tasks.
- There are two broad categories of software: application software and system software.

- **Application software is the set of programs you use on a computer to help you carry out tasks**. If you've ever typed a document, created a spreadsheet, or edited a digital photo, for example, you've used a form of application software.
- **System software is the set of programs that enables your computer's hardware devices and application software to work together.** The most common type of system software is the operating system (OS). It manages the computer system's hardware — such as the monitor and the printer. The operating system also provides a means by which users can interact with the computer.

Input Devices

- An input device enables you to enter data (text, images and sounds) and instructions (user responses and commands) into the computer.

- The most common input devices are the keyboard and the mouse.
  - You use keyboards to enter typed data and commands, whereas you use the mouse to enter user responses and commands.
- There are other input devices as well:
  - microphone
  - scanner
  - digital camera
  - stylus (devices that look like skinny pens but have no ink) & tablet

Keyboards

- The QWERTY layout is standard on most PCs.
- Enhanced keyboard features include number, function, and navigation keys.
- Notebook keys have alternate functions when used in conjunction with the F (function) keys.

Mice

- **Optical mouse**
  - Needs no mouse pad
  - Does not need cleaning
- Trackball

- Easier on wrists
- Stays stationary on desk
- **Wireless mouse**
- Sends data to the computer by radio or light waves.
- **Integrated pointing device**
- Touchpad
- Trackpoint

New Mouse Features

- **Magnifier:** Pulls up a magnification box that you can drag around the screen to enhance the viewing of hard-to-read images. This feature can be used by people with visual disabilities.
- **Customizable buttons:** Extra buttons on the mouse can be programmed to perform the functions you use most often to help you speed through tasks.
- **Web Search:** Allows you to quickly highlight a word or phrase and then press the search button (on the mouse) to start a Web search.
- **File storage:** Includes a wireless USB receiver that contains flash memory to store or back up your files (for example, a USB drive).

Other Input Devices

- Game controllers
- Touch screens
- Digital pens (stylus & tablet)

Image Input

- Digital cameras, camcorders, and cell phones
- Pictures
- Video
- Scanners
- Webcams
- Live video

Sound Input

- Microphones are used for:
- Podcasts
- Videoconferencing
- Internet phone calls
- Speech recognition

Input Devices for the Physically Challenged

- **Visually impaired users can input data**
  - from voice recognition
  - by using large keyboards
  - by using touch-screen keyboards
- **Users with severe motor control problems can use**
  - special trackballs designed for one-finger use that can be mounted anywhere
  - head-mounted pointing devices, when arm motion is severely restrained

Output Devices

- **Output devices enable you to send processed data out of your computer. This can take the form of:**
  - text
  - pictures (graphics)
  - sounds (audio)
  - video
- **One common output device is:**
  - a monitor, which displays text, graphics and video as soft copies (copies you can see only on-screen)
  - a printer, which creates tangible or hard copies of text and graphics
- **Output devices make:**
  - Soft copies (video, sounds, control signals)
  - Hard copies (print)

Monitor Types

- **LCD:** Liquid crystal display
  - Flat panel
  - Light and energy efficient
- **LED:** Light-emitting diode
  - More energy efficient than LCD monitors
  - Better color accuracy and thinner panels
- CRT monitors: Legacy technology

LCD Monitor Features

- Screens are grids made up of millions of tiny dots called pixels.
- Each pixel is composed of red, blue, and green sub-pixels (and sometimes yellow).
- Liquid crystal is sandwiched between two transparent layers to form images.

LCD Quality Factors

- **Aspect ratio:** The width-to-height proportion of a monitor.
- The most important factor to consider when choosing an LCD monitor is **resolution**.
- **Contrast ratio:** A measure of the difference in light intensity between the brightest white and the darkest black that the monitor can produce.
- **Viewing angle:** How far you can move to the side of (or above or below) the monitor before the image quality degrades to unacceptable levels.
- **Brightness:** A measure of the greatest amount of light showing when the monitor is displaying pure white.
- **Response time:** The time it takes for a pixel to change color. The lower the response time, the clearer moving images will appear.

Screen Size

- 21-inch monitor
  - 1680 × 1050 pixels
- 19-inch monitor
  - 1440 × 900 pixels
  - 1280 × 1024 pixels
- HD-DVDs and Blu-ray movies
  - Require at least 1920 × 1080 pixels

Printers

- Inkjet printers
  - Spray tiny drops of ink onto page
- Laser printers
  - Use laser beams and static electricity to deliver toner to page
- All-in-one printers
- Plotters
- Thermal printers

Nonimpact Printers

Inkjet printer:

- work by spraying tiny drops of ink onto paper
- less expensive device
- print high-quality color images cost effectively

Laser printer:

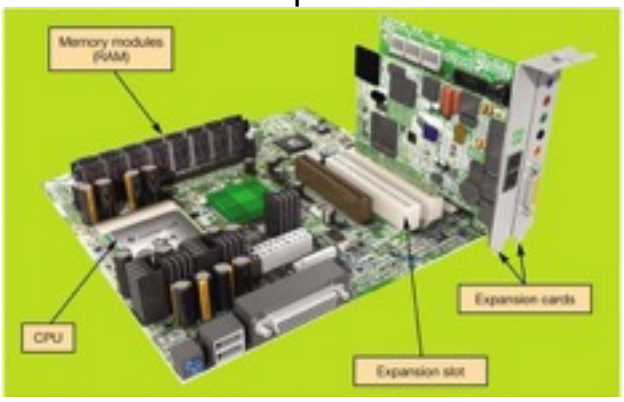
- often preferred for their quick and quiet production and high-quality printouts
- more expensive device
- over the long run, for high-volume printing, laser printers are more economical than inkjets (they cost less per printed black-and-white page) when you include the price of ink and special paper in the overall cost.
- recently, the prices have fallen, making them competitive with high-end inkjet printers.

Choosing a Printer

- **Speed (ppm):** A printer's speed determines how many pages it can print per minute (called pages per minute, or ppm). Printing speeds range from 8 to 30 ppm for both laser and inkjet printers.
- **Resolution (dpi):** A printer's resolution (or printed image clarity) is measured in dots per inch (dpi). The higher the dpi, the greater the level of detail and quality of the image. For general-purpose printing, 300 dpi is sufficient; for printing photos, 1,200 dpi is better.
- **Color output:** Some printers come with a single ink cartridge for all colors; others have two ink cartridges, one for black and one for color. The best setup is to have individual ink cartridges for each color, so you can replace only the specific color cartridge that is empty.
- **Use and cost:** If you will be printing mostly black-and-white, text-based documents or will be sharing your printer with others, a black-and-white laser printer is best because of its printing speed and overall economies for volume printing. If you're planning to print color photos and graphics, an inkjet printer or color laser printer is a must, even though the cost per page will be higher.
- **Cost of consumables:** You should investigate carefully the cost of consumables (printer cartridges and paper) for any printer you are considering purchasing.

The Motherboard

- **The motherboard is the key circuit board holding the essential processing parts.**
- **Attached directly to the motherboard are the:**
- CPU
- RAM
- Expansion cards and slots
- Built-in components



RAM vs. ROM

Random access memory (RAM)

- Stores instructions and data
- Temporary (volatile) storage
- Consists of several memory cards or modules

Read-only memory (ROM)

- Stores startup instructions
- Permanent storage

Central Processing Unit (CPU)

- Referred to as the “brains” of the computer because it controls all the functions performed by the computer’s other components
- Controls all functions of the computer
- Processes all commands and instructions
- Can perform billions of tasks per second without error, making them extremely powerful components

CPU Performance Measures

- **Speed**
  - Megahertz (MHz)
  - Gigahertz (GHz)
- **Cores**
  - Single
  - Dual
  - Quad

Drive Bays

- **Internal drive bays:**
  - cannot be seen or accessed from outside the system unit
  - are reserved for internal hard drives
- **External drive bays:**
  - can be accessed from outside the system unit
  - house CD and DVD drives are covered by a faceplate
  - Floppy and Zip drives (legacy technology)

Hard Drive

- The hard drive is your computer's primary device for permanent storage of software and documents.
- The hard drive is a **nonvolatile storage** device, meaning that it holds the data and instructions your computer needs permanently, even after the computer is turned off.
- Originally, all hard drives were installed inside the system unit. Today, external hard drives are readily available.

Optical Storage

- Compact discs (CDs)
- Digital video discs (DVDs)
- Blu-ray discs (BDs)

Flash Drives/Flash Memory

- **Flash drives (sometimes referred to as jump drives, USB drives, or thumb drives)**
  - are the new alternative to storing portable data
  - plug into USB ports
- **Flash memory cards**
  - Slide into slots in the system

- **Solid state (SSD) hard drives**

Types of Ports

- USB
- Serial and parallel
- Audio and video
- FireWire
- Connectivity
  - Ethernet
  - Modem
- HDMI

Adding Ports

- **Expansion cards**
  - New port standards
- **Expansion hubs**
  - Enable several devices to be connected to a port

Power Controls

- **Power-on button** on the front panel: although you use this button to turn on your system, you do **NOT** want to use it to turn off your system. You turn off the power by clicking on a shutdown icon on the desktop.
- **Cold boot:** powering on your computer from a fully turned off state
- Other options:
  - **Sleep mode**: all the documents, applications and data you were using are stored in RAM, from which they are quickly accessible upon restarting your computer.
  - **Hibernation**: another power-saving mode that stores your data in memory and saves it to your computer's hard disk
  - If you're using Windows 7, you can restart the computer when you click the right arrow button next to the lock button on the Start menu. This is called a **warm boot**. You might need to perform a warm boot if the operating system or other software application stops responding or if you have installed new programs.

Setting It All Up: Ergonomics

- In terms of computing, **ergonomics** refers to how you set up your computer and other equipment to minimize your risk of injury or discomfort.
- The following are some guidelines that can help you avoid discomfort, eyestrain, or injuries while you're working at your computer:
  - **Position your monitor correctly.** This should be at least 25 inches from your eyes and at eye level or so that it is at an angle 15 to 20 degrees below your line of sight.
  - **Purchase an adjustable chair.** Adjust the height of your chair so that your feet touch the floor. The chair should include back support.
  - **Assume a proper position while typing.** Your wrists should be flat with respect to the keyboard, and your forearms should be parallel to the floor. Specially designed ergonomic keyboards and wrist rests can help you achieve the proper position for your wrists.
  - Take breaks from computer tasks.
  - Ensure that the lighting is adequate.