Key Point: *A computer is an electronic device that stores and processes data.*

Term	Definition
Hardware	Hardware comprises the visible, physical elements of the computer.
Software	Software provides the invisible instructions that control the hardware and make it perform specific tasks.

A computer consists of the following major hardware components shown in Figure 1.1.
- A central processing unit (CPU)
- Memory (main memory)
- Storage devices (such as disks and compact disks (CDs))
- Input devices (such as a mouse and a keyboard)
- Output devices (such as monitors (displays) and printers)
- Communication devices (such as modems and network interface cards)
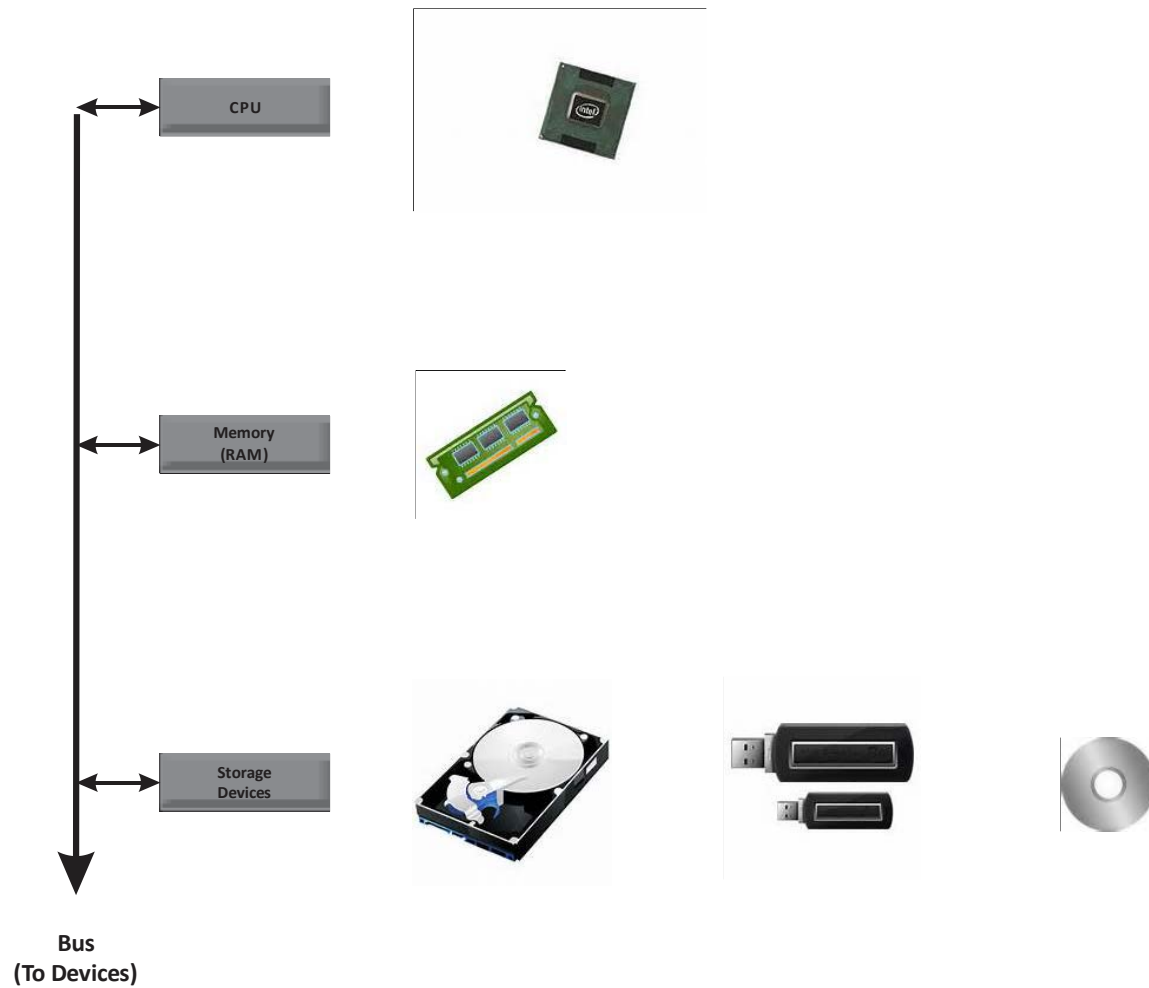
Figure 1.1-1 A computer consists of a CPU, memory, storage devices, input devices, output devices, and communication devices.

**Bus
(To CPU)**

Input
Devices

Output
Devices

Communication
Devices

Figure 1.1-2 A computer consists of a CPU, memory, storage devices, input devices, output devices, and communication devices.

1.2.1   Central Processing Unit

Term	Definition
Central Processing Unit	The central processing unit (CPU) is the computer's brain. It retrieves instructions from memory and executes them. The CPU usually has two components: a *control unit* and an *arithmetic/logic unit*.
Control Unit	The control unit controls and coordinates the actions of the other components.
Arithmetic/Logic Unit	The arithmetic/logic unit (ALU) performs numeric operations (addition, subtraction, multiplication, division) and logical operations (comparisons).
Hertz (Hz)	A hertz is used to measure clock cycles. One hertz is equal to one clock cycle per second. In the 1990s computers had measured clocked speed in *megahertz* ($MHz = 10^6 hz$). The speed of computers has improved so that the clocked speed of computers is measured in *gigahertz* ($GHz = 10^9 hz$).

Figure 1.2-1 A CPU must be cooled with a heat sink and a fan. The CPU has a lattice of many pins on its underside.
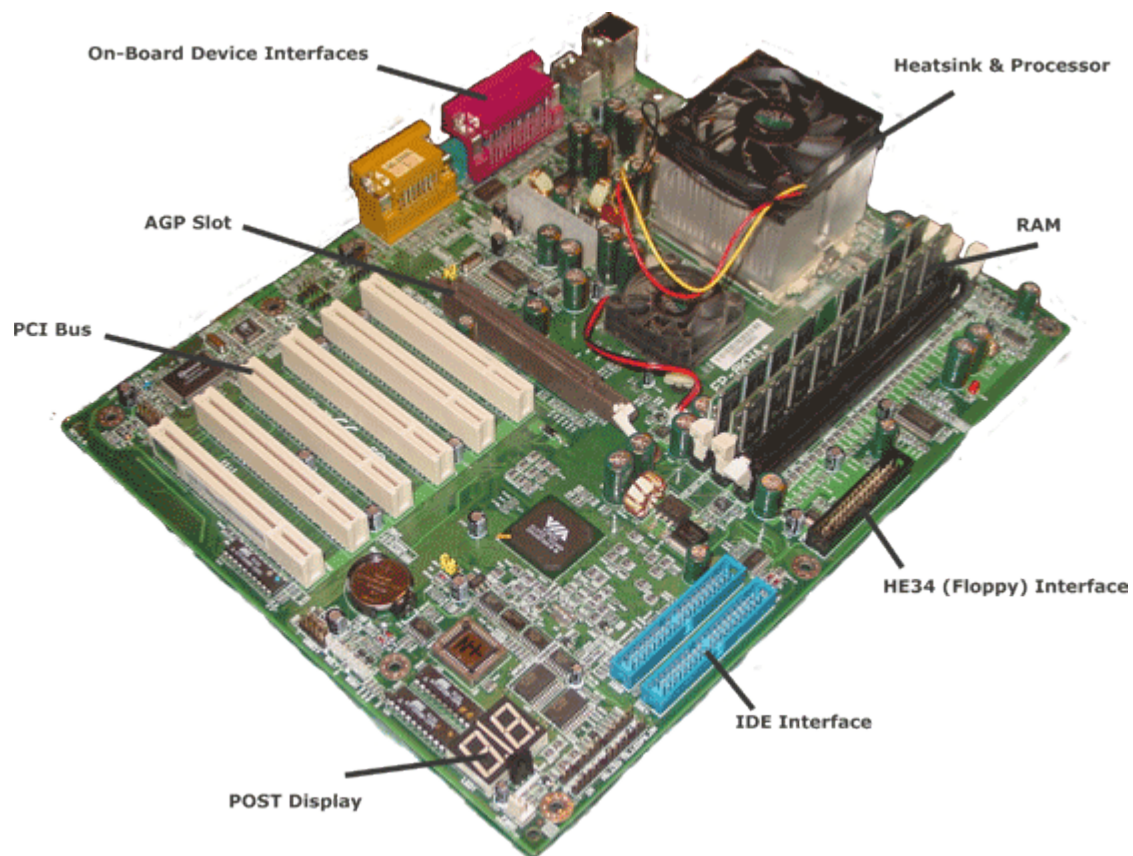
Figure 1.2-2 The motherboard connects all parts of the computer.

1.2.2 Bits and Bytes

Term	Definition
Bit	Bit is the contraction of the term binary digit. A binary digit is like a decimal digit with the exception that instead of having ten (10) possible values, a binary digit can have only two (2) possible values. The two possible values of a bit are 0 and 1.

Term	Definition
Byte	In most computers, a byte is the smallest addressable unit of storage and contains eight (8) bits. The most common use for a byte is to store a character. The American Standard Code for Information Interchange (ASCII) defines character codes that can be stored in a byte. For example, the character **C** is represented as **01000011**.
	Small integer values less than 256 but still greater than or equal to zero can also be stored in a byte. For example, the integer value **3** is represented as **00000011**.

Term	Approximate Value	Actual Value
A kilobyte (KB)	10^3 bytes	$2^{10} = 1{,}024$ bytes
A megabyte (KB)	10^6 bytes	$2^{20} = 1{,}048{,}576$ bytes
A gigabyte (KB)	10^9 bytes	$2^{30} = 1{,}073{,}741{,}824$ bytes
A terabyte (KB)	10^{12} bytes	$2^{40} = 1{,}099{,}511{,}627{,}776$ bytes

1.2.3   Memory

Term	Definition
Memory	Memory is an ordered sequence of bytes for storing programs and data. Programs and data must be copied from disk to memory to be available for the CPU. No program can be executed if it is not stored in memory.
RAM	RAM is *random-access memory*. RAM means that any byte can be accessed about as fast as any other byte. We can understand RAM better by comparing the access time of a byte on a tape. Bytes closer to the head of the tape can be accessed much more quickly than bytes located far from the tape head. We call a tape *serial-access memory*.
	RAM is volatile. When the power is turned off, RAM loses all memory.

Memory Address	Memory Contents	Description
2000	0100 0011	ASCII encoding for character C
2001	0111 0010	ASCII encoding for character r
2002	0110 0101	ASCII encoding for character e
2003	0111 0111	ASCII encoding for character w
2004	0000 0011	Encoding for number 3

1.2.4   Storage Devices

Term	Definition
Storage Device	A storage device is a device that permanently stores programs and data while power is turn on and after power is turned off. There are three main types of storage devices. ■ Magnetic disk drives ■ Optical disc drives (CD and DVD) ■ USB flash drives
Drive	A drive is a device for operating a medium, such as a disk or a CD. A storage medium physically stores data and program instructions. The drive reads data from the medium and writes data onto the medium.

Figure 1.4 A hard disk is a device for permanently storing programs and data.

Term	Definition
CD-R	*CD* stands for *C*ompact *D*isc. There are two types of CD drives: *CD-R* and *CD-W*. A *CD-R* is for read-only permanent storage; the user cannot modify its contents once they are recorded.

Term	Definition
CD-RW	A *CD-RW* can used like a hard disk; that is, you can write data onto the disc, and then overwrite that data with new data. A single CD can hold up to 700 MB. Most new PC's are equipped with a CD-RW drive that can work with both CD-R and CD-W discs.
DVD	*DVD* stands for *D*igital *V*ersatile *D*isc or *D*igital *V*ideo *D*isc. DVDs and CDs look alike, and you can use either to store data. A DVD can hold more information that a CD; a standard DVD can hold 4.7 GB. Like CDs, there are two types of DVDs: DVD-R (read-only) and DVD-RW (rewritable).
USB	A *U*niversal *S*erial *B*us is a device that interconnects many different peripheral devices to the CPU.
USB flash drive	A USB flash drive is a device for storing and transporting data**. You will need a USB flash drive for this course.**

Figure 1.5 USB flash drives are very portable and store a lot of data.
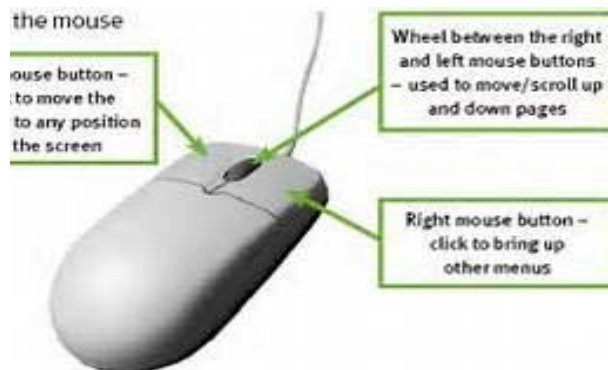
1.2.5   Input and Output Devices

The Keyboard

Figure 1.6 A computer keyboard consists of the keys for sending input to a computer.

Term	Definition
Keyboard	A keyboard is a device for entering characters including letters, digits, punctuation, and special characters.
Function keys	Function keys are located across the top of the keyboard and are prefaced with the letter *F*: their functions depend on the software currently being used.
Modifier key	A *modifier* key is a special key (such as the *Shift*, *Alt*, and *Ctrl* keys) that modifies the normal action of another key when the two are pressed simultaneously.
Numeric keypad	The *numeric keypad*, located on the right side of most keyboards, is a separate set of keys styled like a calculator to use for entering numbers quickly.
Arrow keys	*Arrow keys*, located between the main keypad and the numeric keypad, are used to move the mouse pointer up, down, left, and right on the screen in many kinds of programs.
Insert key *Delete key* *Page Up key* *Page Down key*	The *Insert*, *Delete*, *Page Up*, and *Page Down* keys are used in word processing and other programs for inserting text and objects, deleting text and objects, and moving up or down through a document.

The Mouse

Figure 1.6.1 A mouse is used to position the mouse pointer anywhere on the desktop.

Term	Definition
Mouse	A mouse is a pointing device. It is used to move a graphical pointer (usually in the shape of an arrow) called a cursor around the screen or to click on-screen objects (such as a button) to trigger them to perform an action.

The Monitor

Figure 1.6.2 A monitor displays information (text and graphics). The screen resolution and dot pitch determine the quality of the display.

Term	Definition
Screen resolution	The screen resolution specifies the number of pixels in horizontal and vertical dimensions of the display device.
Pixels	Pixels is short of "picture elements" and are tiny dots that form an image on the screen. A common resolution for a 17-inch screen, for example is 1,024 pixels wide and 768 pixels high. The resolution can be set manually. The higher the resolution, the sharper and clearer the image is.
Dot pitch	The dot pitch is the amount of space between pixels, measured in millimeters. The smaller the dot pitch, the sharper the display.

1.2.6   Communication Devices

Figure 1.7 A local area network connects computers in close proximity to each other.

Term	Definition
Modem	A modem is a modulator/demodulator that converts an analog signal to a digital signal and vice versa.
Dial-up modem	A dial-up modem uses a phone line and can transfer data at a speed up to 56,000 bps (bits per second).
DSL	A *digital subscriber line* (*DSL*) connection also uses a standard phone line, but it can transfer data 20 times faster than a standard dial-up modem.
Cable modem	A cable modem uses the cable TV line maintained by the cable company and is generally faster than DSL.
NIC	A network interface card (NIC) is a device that connects a computer to a local area network as shown in Figure 7.
LAN	A local area network (LAN) is a collection of software, cables, and NICS that permit computers on the network to communicate with each other. A high-speed NIC called 1000BaseT can transfer data at 1,000 million bits per second (mbps).
Wireless	Wireless networking is now extremely popular in homes, businesses, and schools. Every laptop computer sold today is equipped with a wireless adapter that enables the computer to connect to a local area network and the Internet.