Computing Fundamentals and Programming
Batch 2012 (Electronics and Telecomm)
Chapter 1: Introduction and Overview to Computers.

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Computer Professional:

A **computer professional** is a person who has a certain amount of experience and/or at least a two-year degree in the technical aspects of using computers. Examples: Software engineer, computer programmer, systems analyst, network administrator.

Computer User:

A **computer user** is a person without much technical knowledge of computers but who uses or wants to use computers to perform work-related or personal tasks, enhance learning and productivity, or have fun. Examples: Students, teachers, executives and other professionals

Computer literacy:

Computer literacy is having an understanding of what a computer is and how it can be used as a resource.

Computer Competency

Computer competency is applying your skill with computers to meet your information needs and improve your productivity.

Computer competency and literacy depend on the following:

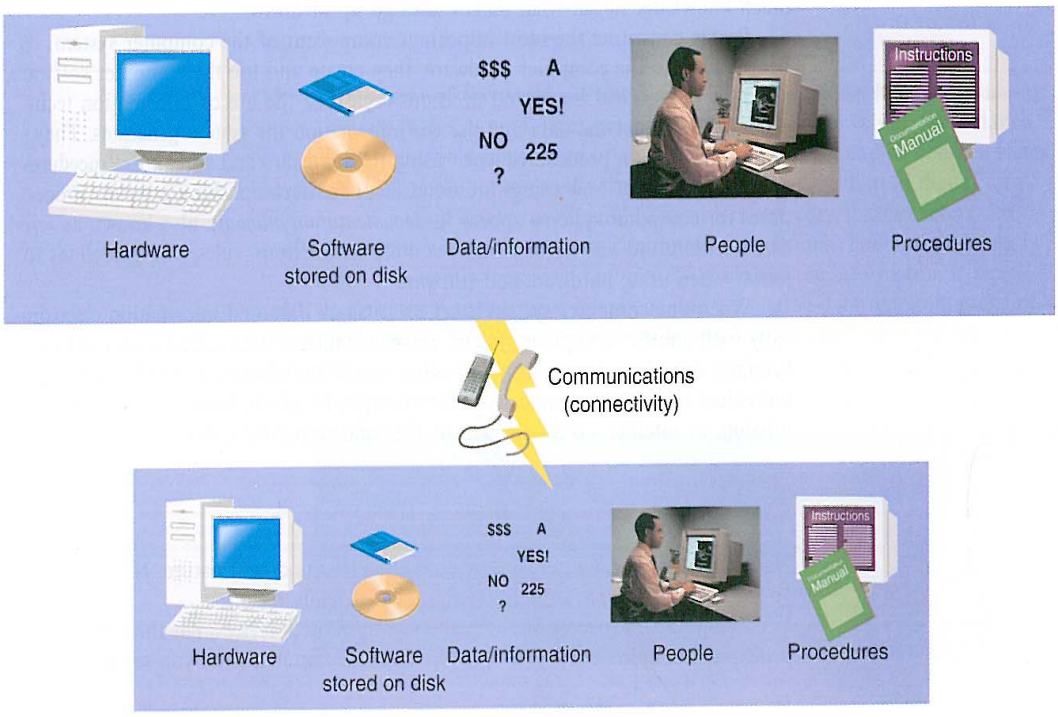
- Mastery of computer terminology
- Understanding the functions of computers and their component parts
- Learning to use computers to produce the information you need and perform the tasks required.
- Gaining the flexibility to understand various types of computers and software.

Computer Based Information System

The term **computer** describes a device made up of a combination of electronic and electromechanical components.

Computer **hardware** refers to the physical equipment that makes up a computer and computer system

.But, hardware can't be used until it is connected to other elements, all of which constitute the six parts of a **computer-based information system**



Hardware

Computer **hardware** refers to the physical equipment that makes up a computer and computer system

Software

Software describes the instructions that tell the **hardware** how to perform a task.

Data/Information

Data consists of raw facts and figures that are processed into information.

Information is summarized or other wise manipulated (processed) data.

People

The most important component of the computer system—we operate computer hardware, design and use computer software, enter data and use information, and we face ethical issues and decisions about the use of information technology.

Procedures

Procedures are descriptions of how things are done, steps for accomplishing a result.

You find procedures in documentation manuals and user guides, which contain instructions, rules, and guidelines to follow when using hardware and software.

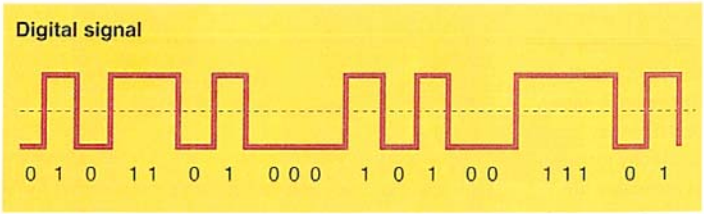
Communications

Communications, also called connectivity, becomes an element when one computer system is set up to share data and information electronically with another computer system.

The manner in which individual computer systems are connected becomes an element of the total computer system.

Digital Signals:

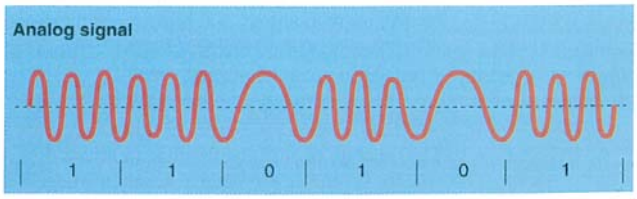
Digital refers to communications signals or information represented in a discrete or individually distinct form. In other words on or off, 0 or 1.



In the binary system, each 0 and 1 is called a **bit**—short for **binary digit**. Bits are grouped in various combinations to represent numbers, letters, punctuation marks, etc. A group of eight bits is called **byte**, and each character is represented by 1 byte.

The Analog Basis of Life:

- Most phenomena of the world are not digital, they are **analog**, having continuously variable values. For example, sound, light, temperature, and pressure values can fall anywhere on a continuum or range.
- Historically, analog devices have been used to represent the highs, lows, and in-between states of analog phenomena.
    - Examples of analog devices include: humidity recorders, mercury thermometers
    - The electrical signals on a telephone line, radio, broadcast television, and cable TV have traditionally been transmitted as analog data.

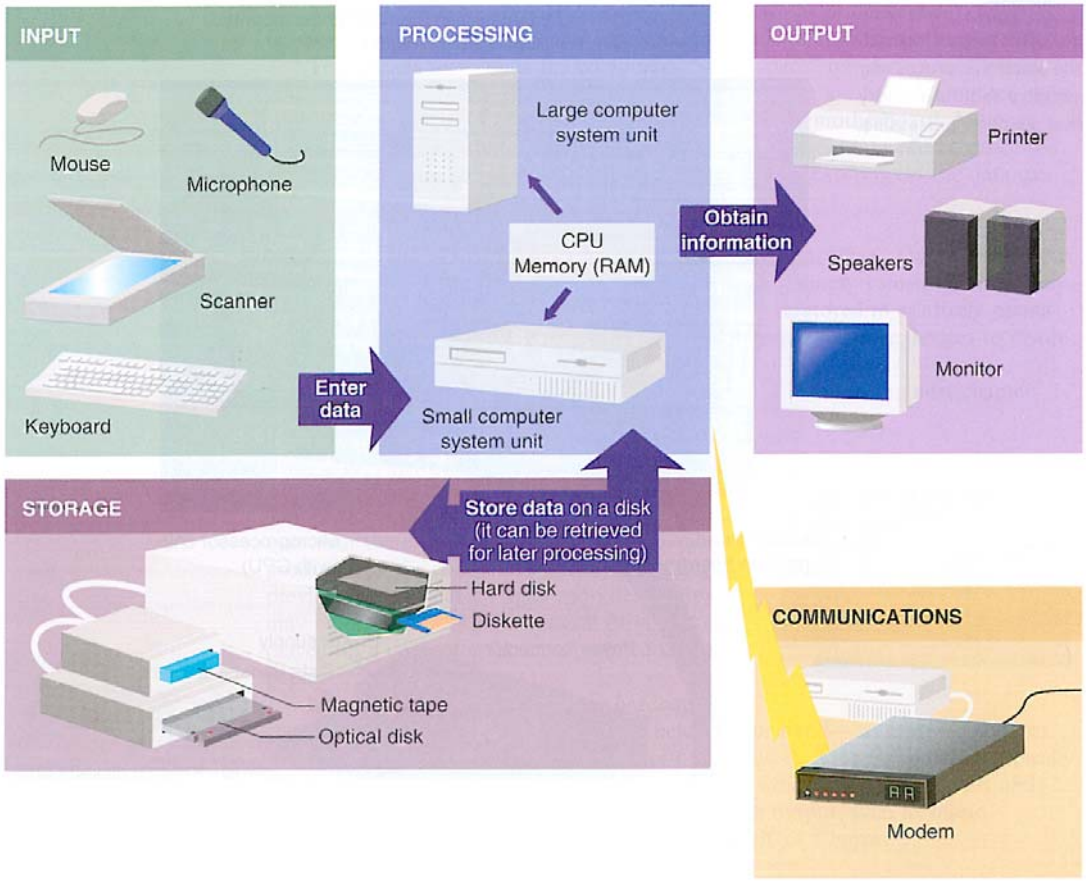


Categories of Computer Hardware

Hardware is what most people think of when they visualize a computer system. Some hardware components are: the keyboard, screen, printer, and the computer or processing device itself. In general, computer hardware is categorized according to which of the five operations it performs

- Input
- Processing and memory
- Output
- Storage
- Communications

Peripheral devices are those devices connected to the computer and controlled by the computer. These devices can be external (keyboard, mouse) or internal (floppy disk drive).



Computer Hardware Diagrammatic Illustration

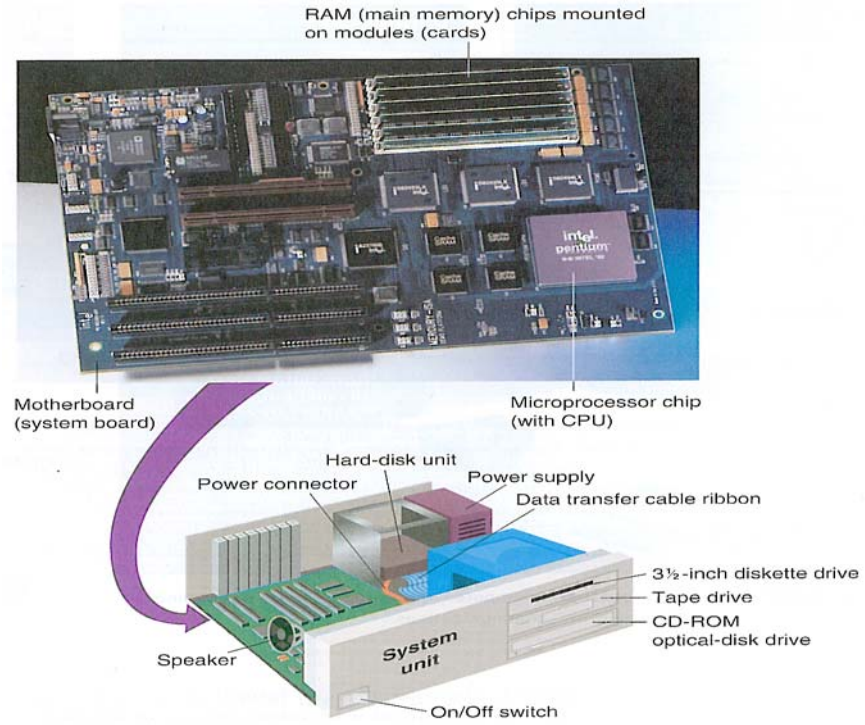
Input Hardware:

Function: To accept data and convert it into a form suitable for computer processing

Examples of input hardware: Keyboard, mouse, scanner

Processing and Memory (Primary Storage) Hardware:

The processing and main memory devices, housed in the computer's system unit, make up the computer's control center.



System Unit (system cabinet A hardware component that houses the **processing hardware**—the electronic circuitry responsible for doing the actual processing and the memory that supports that processing.

Processing Hardware Components:

CPU—the processor: The CPU, for **central processing unit**, is the processor, or computing part, of the computer. In microcomputers, the CPU is called a *microprocessor*, which is an approximately 1.5 inch square chip mounted on the main circuit board called the *motherboard*, or *system board*.

Memories—also knows as primary storage, main memory, and RAM (*random access memory)*—is temporary working storage. Memory, contained on memory chips mounted on the motherboard, is the computer's "work space," where data and programs needed for immediate processing are held. Memory capacity is important for determining the amount of data that can be processed at once and the size/complexity of the programs used to process the data.

Output Hardware:

Function: To provide the user with the means to view and use information produced by the computer system

Information is either output in *hardcopy* or *softcopy* form.

Hardcopy output can be held in your hand—a paper printout.

Softcopy output is typically displayed on a monitor—a TV-like screen on which you can read text and graphics. Softcopy output can also refer to audio output, like music.

Secondary Storage Hardware:

Function: To store software and data in a form that is relatively permanent (*nonvolatile—not lost when the power is turned off*) and easy to retrieve when needed for processing.

Data is stored as electromagnetic signals or laser-etched spots, commonly on magnetic disk, optical disk, or tape.

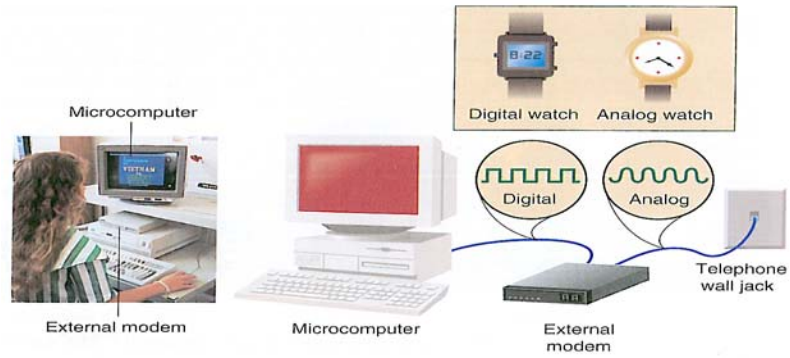
Communications Hardware

Function: To facilitate the connections between computers and between groups of connected computers called *networks*.

Connections allow the sharing of hardware, software, and data resources, extending a computer's range and utility.

A *modem* is a piece of communications hardware needed to transmit a computer's digital signals over standard analog telephone lines, allowing computers to communicate with each other over the phone lines.

Modem: This device transforms digital signals from your computer into analog signals capable of being transmitted over analog phone lines.



Software and its Catagorization:

Software is any set of instructions that guides a computer's actions—what to do and how and when to do it.. Software consists of a group of related *programs* written in a specific code, called a *programming language*, based on the computer's language of 0s and 1sSoftware is generally divided into two categories:System software, Applications software

System software is software designed to allow the computer to manage its own resources and run the hardware and basic operations.

Basic operations: lets the CPU communicate with the keyboard, the screen, the printer, and the disk drive Examples of system software:DOS, Windows, OS/2, Macintosh Operating System, Netware (Novell Operating System), Unix, Linux

Applications Software: Applications software is software that performs tasks to directly benefit or assist the user.Examples of applications software are programs like:Word processors, desktop publishers, payroll processing software, or animation

Types of Computers

Computers come in a variety of sizes and with a variety of processing capabilities. They can be categorized as:

Supercomputers **Supercomputers** are the fastest and highest-capacity computers.

- They were first developed in the 1970s, and their uses include worldwide weather forecasting and analysis of weather phenomena, oil exploration, aircraft design, evaluation of aging nuclear weapons systems, predictions of spreads of epidemics, and mathematical research.
- Supercomputers have hundreds to thousands of processors and can perform trillions of calculations per second.
- Supercomputers can cost several hundreds of thousands to millions of dollars and can take up an entire room.

Mainframe computers

- **Mainframe computers** are less powerful than supercomputers, but they are still fast, mid- to large-size, large-capacity machines.
- Their size depends on the number of concurrent users they are serving—from a few hundred to thousands of people.
- Mainframes are used by places like banks, airlines, universities, and the Internal Revenue Service.

Workstations

- **Workstations** are expensive, powerful desktop computers.
- Introduced in the early 1980s, workstations are used primarily by engineers, scientists, and special-effects creators for sophisticated purposes—designing airplane fuselages, prescription drugs, and movies' special effects.
- Workstations are often connected to a larger computer system to facilitate the transfer of data and information.

Microcomputers

- **Microcomputers**, also called *personal computers* (PCs), are small computers that can fit next to a desk or on a desktop, or can be carried around.
- They are used for personal and professional purposes—word processing, desktop publishing, managing finances, etc.
- Microcomputers come in variety of sizes: desktop, tower, notebook, palmtop, electronic organizer, or pen-based. Microcomputers can exist either as stand-alone machines or connected to a network, such as a **local area network (LAN)**, where a group of desktop PCs and peripheral devices are linked within an office or building.

Microcontrollers

- **Microcontrollers** are tiny computers installed in "smart" appliances like microwave ovens and pocket calculators.
- Also called *embedded*, *dedicated*, or *hidden computers*, microcontrollers are dedicated to performing a restricted number of tasks.

Note: The predominant information system is now a hybrid model, whereby a variety of computer systems are connected, operated, and used by many people.

- Example: A mainframe computer manages company-wide customer data; employees in branch offices around the country access the mainframe using a desktop microcomputer; that same microcomputer can be used to perform specialized tasks (generating invoices, drafting letters); employee microcomputers might be networked and/or have access to the Internet.
- Networked computers and those with access to the Internet will have need for a *server*. A **server** (or *network server*) is a central computer that holds collections of data (databases) and programs for many PCs, workstations, and other computers, which are called *clients*. The entire network is called a *client/server network*.

    - For small organizations, servers can store files and transmit electronic mail (e-mail).
    - In large organizations, servers can house enormous libraries of financial, sales, and product information.
    - Servers also store the information available to users of the Internet and the World Wide Web.
    - Servers are discussed in more detail in Chapter 8.

The Evolution of Computers:

- The first large-scale electronic computer, the grandparent of today's handheld machines, was the Electronic Numerical Integrator and Computer (ENIAC), which became operational in 1946.

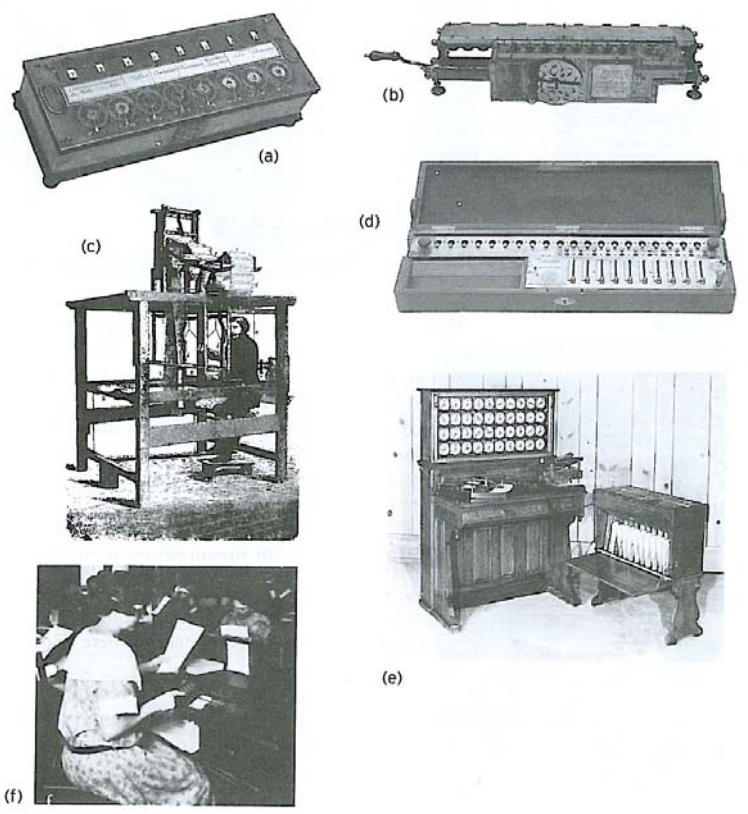
    - ENIAC contained ~18,000 light-bulb-size electronic vacuum tubes that controlled the flow of electric current.
    - It weighed 30 tons and occupied 1800 square feet of floor space!
    - It could multiply four numbers in the then-remarkable time of 9 milliseconds.

- Since ENIAC, computers have progressed through four *generations,* each one characterized by smaller size, more power, and less expense than its predecessor.

First Generation (1944-1958):

    - Most input and output media were punched cards and magnetic tape.
    - Main memory was almost exclusively made up of hundreds of vacuum tubes.

- Computers were unreliable because the vacuum tubes failed frequently.
- They were slower than any microcomputer used today (they could run only one program at a time), produced a tremendous amount of heat, and were very large.
- ENIAC and UNIVAC I are examples of first-generation computers.
- UNIVAC was priced at $500,000; today, you could purchase microcomputer chips with the same processing power for less than $100.



Second Generation (1959-1963):

- By the early 1960s, transistors and other solid-state devices started replacing vacuum tubes in computer circuitry. (A transistor is an electronic switch that alternately allows or does not allow electronic signals to pass.)
- Magnetic cores, looking like metal washers strung together by electrical wires, became the most widely used type of main memory.
- Removable magnetic disk packs, stacks of disks connected by a common spindle (like a stack of records), were introduced as storage devices.
- Second-generation computers tended to be smaller, more reliable, and significantly faster than first-generation computers.

Third Generation (1964-1970):

- During this generation, the integrated circuit (IC), replaced transistorized circuitry. (An integrated circuit is a complete electronic circuit that packages transistors and other electronic components on a small silicon chip.)

    - The use of magnetic disks for secondary storage became widespread.
    - Some computers began to support multiprogramming (processing several programs concurrently) and timesharing (multiple concurrent users).
    - Minicomputers, priced around $18,000, were being widely used by the early 1970s and were taking some business away from the established mainframe market. This was because what formerly required the power of a mainframe now could be done on a minicomputer.

Fourth Generation (1971-Present):

- Large-scale integrated (LSI) and very-large-scale integrated (VLSI) circuits were developed that contained hundreds to millions of transistors on a tiny chip.
- 1971: Ted Hoff of Intel developed the first microprocessor, which packaged an entire CPU, complete with memory, logic, and control circuits, on a single chip.
- This started the trend toward computer miniaturization—the development of smaller and smaller computers. During this time, we also see costs dropping while availability and capability increased.
- With memory capacity increasing and cost decreasing, software types and usefulness were affected. Software applications like word processing, electronic spreadsheets, database management programs, painting and drawing programs, desktop publishing, and so forth became commercially available, giving people more reasons to use a computer.

Fifth Generation (Present and Beyond): Artificial Intelligence

- Fifth generation computing devices, based on artificial intelligence, are still in development, though there are some applications, such as voice recognition, that are being used today.
- The use of parallel processing and superconductors is helping to make artificial intelligence a reality. Quantum computation and molecular and nanotechnology will radically change the face of computers in years to come.
- The goal of fifth-generation computing is to develop devices that respond to natural language input and are capable of learning and self-organization.