# Lab 01:

## Introduction to Computer Systems

# Objectives

- Develop an understanding of
  - What is a computer?
  - What is a computer system?
  - What is computer hardware and software?
  - How computers are classified?
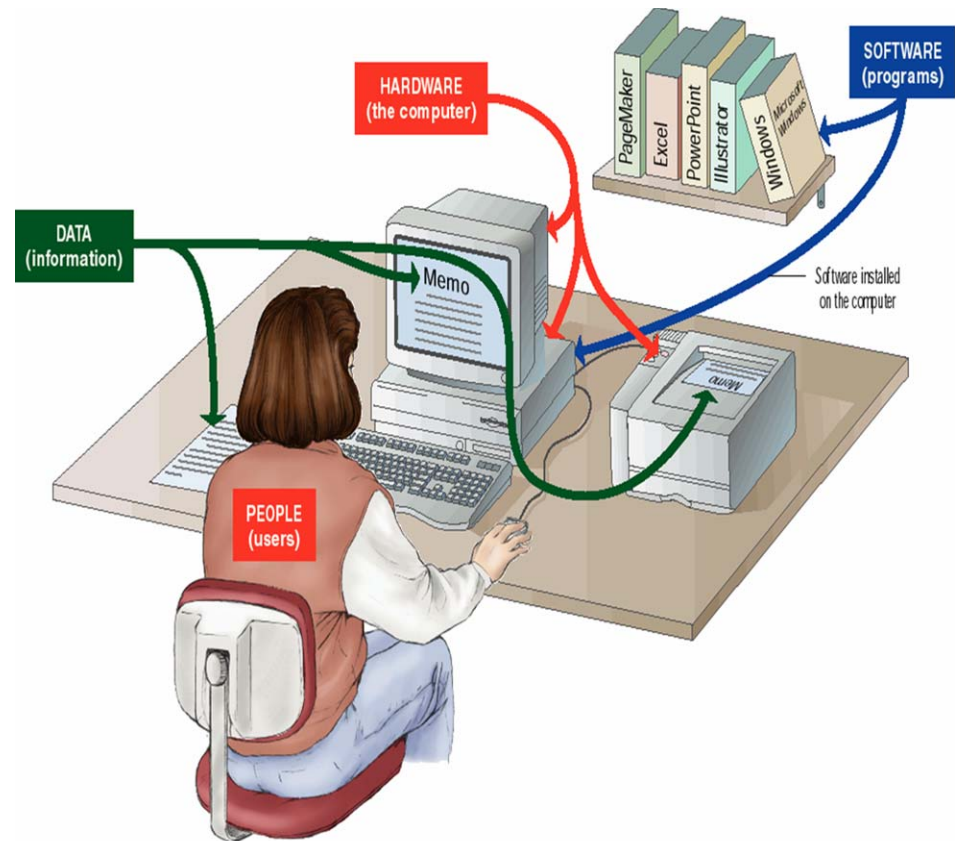  - What are the copyrights?

# What is a Computer?

A computer is an electronic device that accepts input, processes it according to a series of instructions (called computer programs or software), and produces output.

# What is a Computer System?

A complete computer system consists of four parts

    1. Hardware
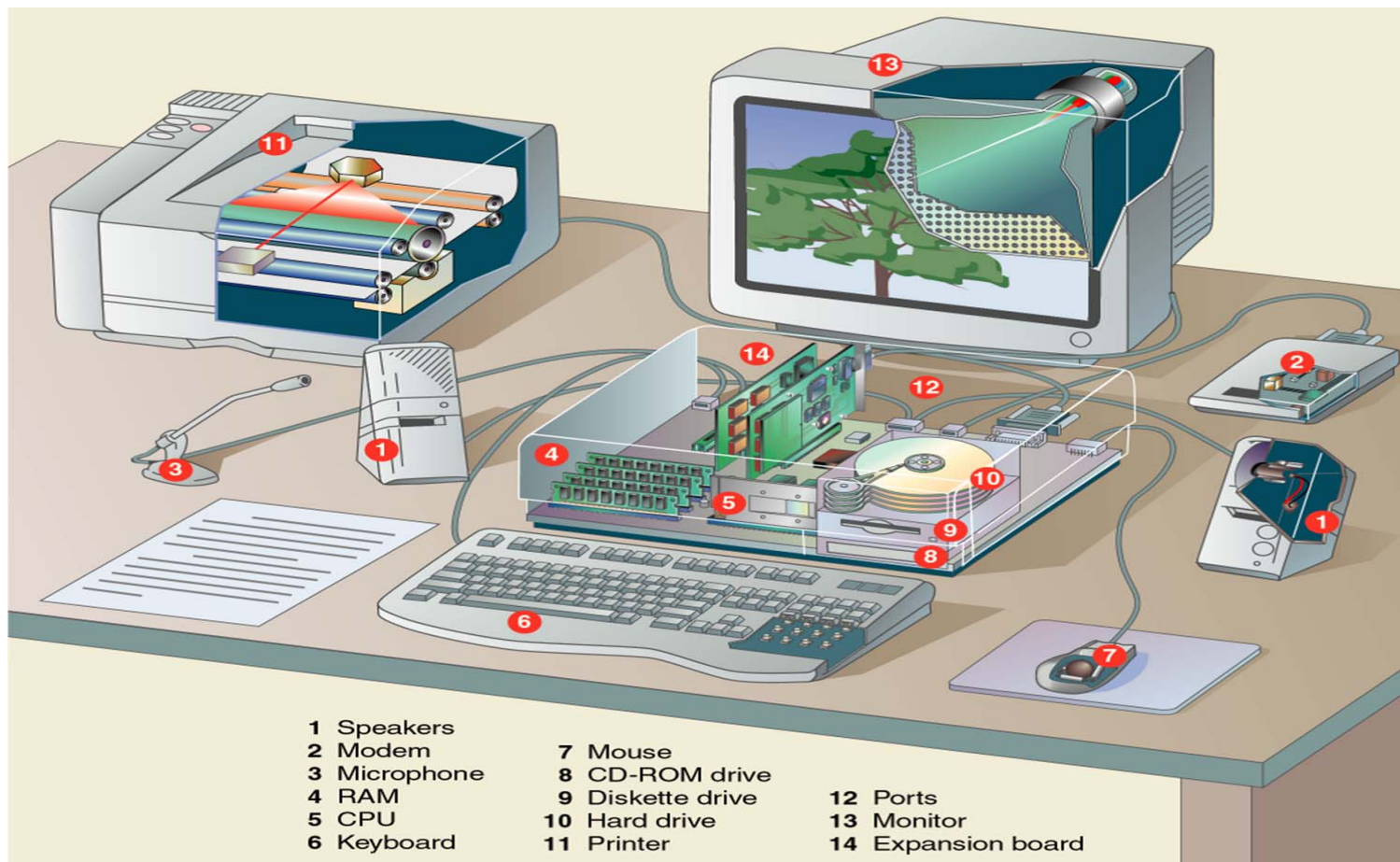    2. Software
    3. Users
    4. Data

# Hardware

- The physical devices that make up the computer are called hardware

- A computer's hardware consists of interconnected electronic devices

- Computer hardware illustration

  - Next slide

# Hardware (cont..)



1 Speakers
2 Modem
3 Microphone
4 RAM
5 CPU
6 Keyboard
7 Mouse
8 CD-ROM drive
9 Diskette drive
10 Hard drive
11 Printer
12 Ports
13 Monitor
14 Expansion board

# Hardware (cont..)

- Main categories of computer hardware are
  - Processor
  - Memory (also called main memory or primary memory
  - Storage ( also called secondary memory)
  - Input/output devices

# Processor

- The processor is the hardware that organizes and carries out instructions that come from either the user or the software

- In a personal computer, the processor usually consists of one or more microprocessors.

- The term **Central Processing Unit (CPU)** refers to the computer's processor.
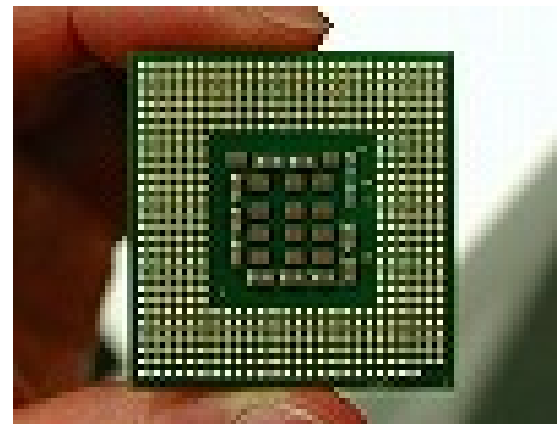
# Processor (Cont..)

- A processor consists of three functional units

  1. Arithmetic Logic Unit (ALU) --- performs arithmetic operations such as addition and subtraction.

  2. Registers --- hold data that is being processed by the ALU

  3. Control Unit (CU) --- fetches each instruction from the memory and instructs the ALU to process it

- Instruction cycle

  - Execution of each instruction consists of 4 steps:

    1. Fetch       2. Decode
    3. Execute     4. Store

- Processor speed is measured in

  - MegaHertz (MHz) --- one million instruction cycles per second

  - GigaHertz (GHz) --- one billion instruction cycles per second

# Motherboard

- Rigid rectangular card containing the circuitry that connects the processor to the other hardware is called a motherboard.

- Motherboard is an example of a circuit board

- In most personal computers, many internal devices such as video cards, sound cards, disk controllers are housed in the motherboard.
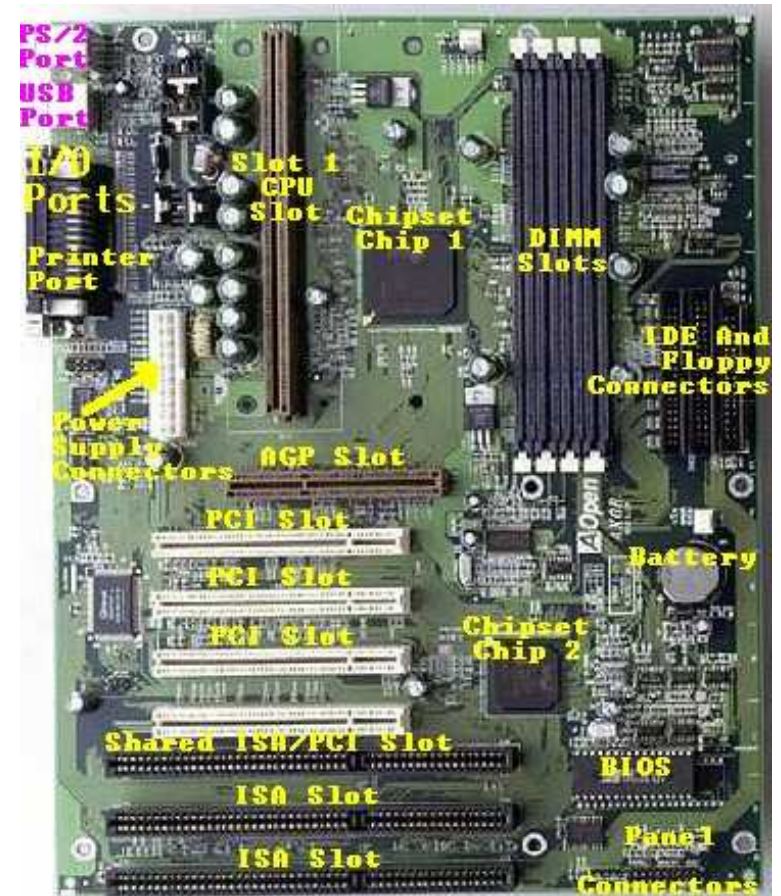
# Memory

☐ Memory of a computer is hardware that is used to store programs and data

☐ There are many types of memory.

- RAM (random Access Memory)

- ROM (Read Only Memory)

- Cache memory

☐ The most common type of memory is the Random Access Memory (RAM)

# Random Access Memory (RAM)

- ☐ Data can be both written to and read from the memory.

- ☐ It is important to note that the RAM is volatile

- ☐ Size of RAM determines a computer's speed and power

- ☐ The more RAM a computer has, the more data and programs it can store and it can perform tasks faster.

# Units of Measure for Computer Memory

- The basic unit of computer memory is "Byte"
- Bigger units of measure of memory are
  - Kilobyte (KB) --- one thousand bytes
  - Megabyte (MB) --- one million
  - Gigabyte (GB) --- one billion
  - Terabyte (TB) --- one trillion

# Processing

□ The procedure that transforms input data into output (useful information) is called processing

□ The **processor** and **memory** together perform this transformation or do the processing

# Input/Output Devices

- A computer would be useless if it cannot take data from its users and after processing it return the results.

- An **input device** is used to accept data and instructions from the user or from another computer system

- An **output device** is used to return processed data to the user or to another computer system

# Common Input Devices

- Keyboard
- Mouse
- Touchpad
- Scanners
- Digital cameras
- Joysticks
- Microphone
- Trackballs

# Common Output Devices

- Monitor
  - The most commonly used output device
  - Types of monitors
    - Cathode ray tube (CRT)
    - Flat-panel display
  - A touch screen is an example of a device which acts as both input and output device.

- Printers
  - Used to produce hard copy or printed output
  - Types of printers
    - Dot matrix printers
    - Ink jet printers
    - Laser printers

- Storage

# Storage

- A computer needs a place to store program files and related data when they are not in use.

- **Storage** is used to store programs and data permanently

- Storage is similar to electronic file cabinet

- There is more space in storage than in memory.

- Contents are retained in storage when the computer is turned off.

- Storage is very slow when compared to the memory

- Storage is cheaper than the memory.

# Storage (Cont..)

- ☐ Two components of storage are Device and medium
  - ■ Hard disk drive and hard disk
  - ■ Diskette drive and Diskettes or floppy disks
  - ■ CD-ROM drive and Compact disks (CDs)
    - ☐ Compact Disk-Read-Only Memory (CD-ROM)
    - ☐ CD-Recordable (CD-R)
    - ☐ CD-Rewritable (CD-RW)
  - ■ DVD (Digital Video Disk) player and DVD
  - ■ USB flash drive

# Software

□ A set of instructions that makes the computer perform tasks (also called computer program)

□ Two categories of software

1. System software

   Programs primarily for the computer's use, helping it to perform tasks and manage its own resources like operating systems, network management systems, device drivers, compilers

2. Application software

   Programs developed for the users, enabling them to perform tasks such as word processors, library systems, Student Information System (SIS) at KFUPM

# Users and Data

- Users
  - People who use the computer and interact with it
- Data
  - Data consists of individual facts or bits of information like cell phone number, date of birth of a person, etc.
  - The Computer reads and stores data of all kinds (words, numbers, images, or sound) in digital form
  - Within computer, data is organized into files

# Categories of Computers

- Computers are classified into various categories according to the size and computing power.

- Main categories of computers are
  1. Supercomputers
  2. Mainframe computers
  3. Minicomputers
  4. Workstations
  5. Microcomputers, or personal computers

# Supercomputer

- A computer falls into the supercomputer category if it is, at the time of construction, one of the fastest computers in the world.

- A super computer can perform more than one trillion calculation per second.

- Typical uses for supercomputers include mapping of human genome, weather forecasting, and modeling complex processes like nuclear fission.

# Mainframe Computer

- A mainframe computer (or simply a "mainframe") is a large computer capable of simultaneously processing data for hundred or thousands of users.

- Mainframe computers are used in large organization where many people need access to the same data, like KFUPM uses mainframe for student information system

- A device called terminal is used to access the mainframe computer.

- Mainframes of today are accessed by microcomputers that imitate terminals

# Minicomputers



- A minicomputer is a mid-sized computer designed to accept input from multiple input terminals.

- Minicomputers were first released in the 1960s.At that time these computers were quite small when compared to the other computers of that time. That is how they got the name, minicomputer.

- The capabilities of a mini computer are in between the Mainframe and the personal computers.

# Workstations

- Workstations are nothing but computers with many of the features of the personal computer but with the processing capability of a mini computer.

- The machines are used by scientists, engineers and animators who need a lot of number-crunching power

# Personal Computer (PC)

- Personal computers (PC) also called microcomputers are designed to meet the computing needs of an individual.

- Various forms of personal computers are,
  - Desktop PC
  - Notebook/laptop PC
  - Handheld PC
  - Tablet PC

# Desktop PC

- A desktop personal computer fits on a desk and runs on power from electrical wall outlet.

- The main unit can be housed horizontally under a monitor or it can be housed in a vertical case.

- Desktop personal computers are commonly used in offices, schools, and homes.

# Notebook Personal Computers

- A notebook personal computer (also called laptop) is a small lightweight computer that incorporates screen, keyboard, storage, and processing components into a single portable unit.

- As their name implies the notebook computers are approximately the size of a notebook.

- Notebook personal computers can run both on power supply from an electrical outlet or batteries.

# Handheld PC

- A handheld personal computer features a small keyboard or touch sensitive screen and is designed to fit into a pocket, runs on batteries, and be used while holding it.

- Handheld PCs are also called palmtop computers.

- A popular type of handheld computer is the personal digital assistant (PDA).

# Tablet PC

- A tablet personal computer is a portable computing device featuring a touch-sensitive screen that can be used as a writing or drawing pad.

- The tablet PC is the newest development in portable, full featured computers.

- Tablet PCs offer all the functionality of a notebook PC, but they are lighter than the notebook PC.

- A tablet PC can accept input from the electronic pen or from the user's voice.

# Copyrights

- Intellectual property refers to property that is the result of creativity and intellectual effort.

- A software is an intellectual property of the person or company that developed it

- People who create intellectual property deserve to benefit from their ideas

- Many laws and regulations have been established to govern the use and distribution of intellectual property

# Copyrights (Cont..)

- ☐ Trademarks, patents, and copyrights are legal protections for intellectual property

- ☐ Trademarks usually protect logos and product names

- ☐ Patents usually protect inventions

- ☐ Copyrights typically protect works such as software, books, and music
  - ■ Many copyrighted works include a copyright notice

- ☐ Good citizens abide by the copyrights

# Review Questions

- List the four key components of a computer system.

- List the three major distinctions between storage and memory.

- What are the five main categories of computers.

# Summary

- Computer
- Computer system
- Hardware
    - Processor
    - Memory
    - Input/output devices
    - Storage
- Software
    - System software
    - Application software
- Categories of computers
- Copyrights