Faculty of Engineering and Technology

Computer Science Department

Introduction to Computer and Computing Ethics

COMP1310

Course Objectives

- Computer systems
  - Terminology
  - Structure
  - Data representation
  - Usage of different popular computer applications.
- Familiarizes students with algorithms.
- Programming by Alice as a tool.
- Computer Science as a discipline.
- The ethics of computing.

Learning Style

- Lectures
- Labs

Lab Outline

Lab #	Topic	Quizzes
1	Introduction (OS)	
2	MS Office (MS Word)	
3	MS Office (MS Excel)	
4	Numbering System	(Q1 on MS Excel)
5	Designing Computer Algorithms	
6	MS Office (MS Power Point)	(Q2 on Numbering + Algorithms)
7	Programming using C (Variables + Arithmetic operations +Simple program)	
8	Functions	
9	If statements + switch cases	Q3 on Simple program + Functions
10	Loops 1	
11	Loops 2	Q4 on Loops
12	Pointers1	
13	Pointers review	Q5 Pointers

What is a Computer?

- a *computer* is a device that **receives**, **stores**, and **processes** data.

- **receives** data, **store** it and **process** it into useful information.

Data VS. Information

???

Data VS. Information

- Data: raw facts representing objects and events.
- Information: data that is organized, meaningful and useful.

Fundamental Characteristics of Computers

- Speed
- Reliability
- Storage capability

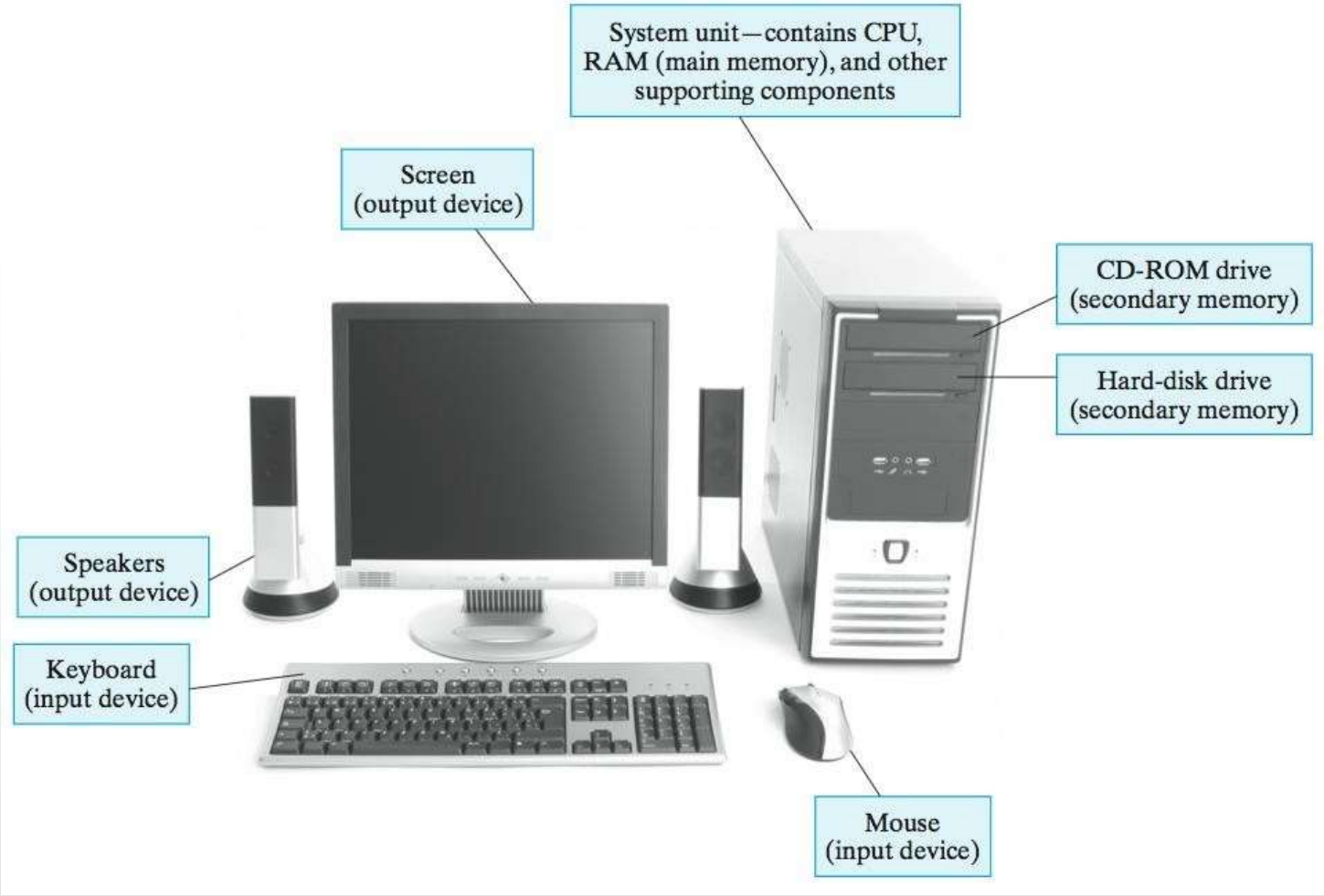
Computer System Components

- **Hardware:** the physical components of a computer system.
  e.g., monitor, keyboard, mouse, hard drive
- **Software :** the programs that execute on the computer.
  e.g., word processing program, Web browser
- **People:**
  1. Programmer: writes software
  2. End-User: purchases and uses software

Computer System Components

		Desktop System 1	Desktop System 2
	CPU	2.2 GHz Intel Celeron 450	3.2 GHz Intel Core i5
HARDWARE	Memory		
	Cache	512 KB cache	4 MB cache
	RAM	4 GB RAM	8 GB RAM
	Hard Drive	320 GB hard drive	1 TB hard drive
	CD-ROM/DVD	DVD+/–RW drive	DVD+/–RW drive
	Input/Output		
	Keyboard	USB multifunction keyboard	wireless multifunction keyboard
	Pointing Device	USB optical mouse	wireless optical mouse
	Screen	20" HD flatscreen monitor	24" HD flatscreen monitor
	Speakers	Multimedia Speaker System	Dolby Surround Sound Speakers
	Network Adapter	Integrated 10/100/1000 Ethernet	Integrated 10/100/1000 Ethernet Integrated wireless card & antenna
SOFTWARE	Operating System	Windows 7 Home Premium	Windows 7 Professional
	Web Browser	Internet Explorer 8	Internet Explorer 8
	Productivity Suite	Microsoft Works 9	Microsoft Office Professional 2007
	Security	McAfee Security Center	McAfee Security Center

Desktop computer, with its hardware components



Computer Classes

- **Personal Computers**
- **Portable Computers**
- **Servers**
- **Super Computers**
- **Handheld Devices**
- **Embedded Systems**

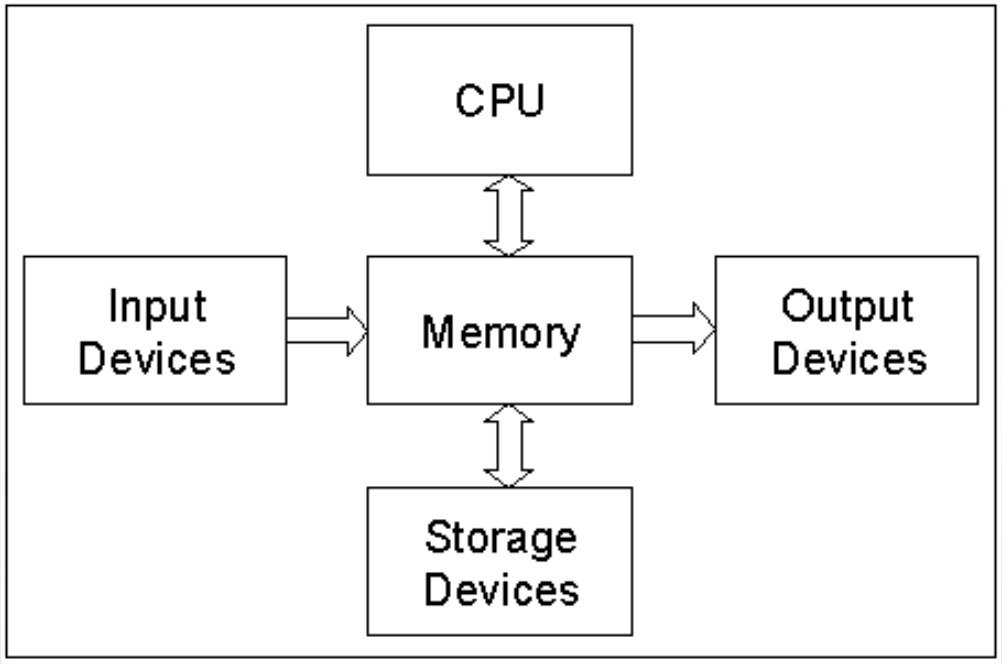
Types of Computers

Different types of computers have different characteristics:

- *supercomputers:* powerful but expensive; used for complex computations
  (e.g., weather forecasting, engineering design and modeling)
- *desktop computers:* less powerful but affordable; used for a variety of user applications
  (e.g., email, Web browsing, document processing)
- *laptop computers:* similar functionality to desktops, but mobile

palmtop computers: portable, but limited applications and screen size

Hardware



Central Processing Unit (CPU) or (Processor)

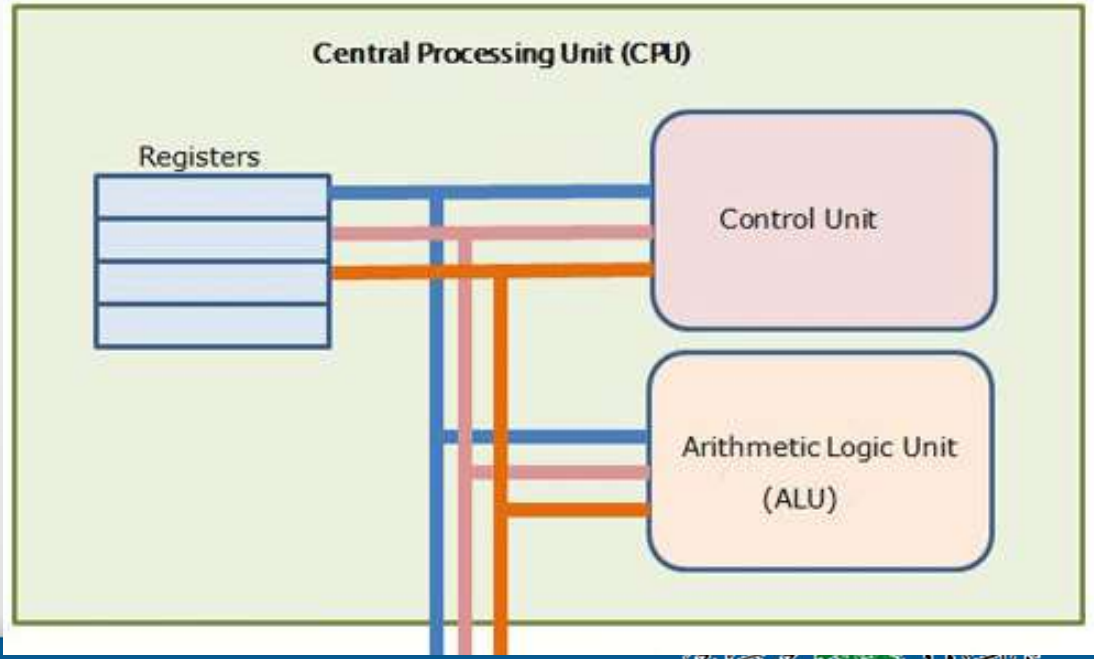
- the CPU is the "brains" of the computer
- Consists of electronic circuits:

The CPU is made up of three main parts:

Control Unit (CU)

Arithmetic Logic Unit (ALU)

Registers



Central Processing Unit (CPU) or (Processor)

Control Unit :

1) Directs the computer system to execute stored program instructions.

2) Communicate with memory and ALU

3) Sends data and instructions from secondary storage to memory as needed.

Central Processing Unit (CPU) or (Processor)

Arithmetic Logic Unit :

1) Execute all arithmetic and logical operations

Arithmetic operation:

Addition, Subtraction , Multiplication, Division

Logical operations:

Compare numbers, letters or special characters

(Equal, Less than, Greater than,..)

Central Processing Unit (CPU) or (Processor)

Registers:

- ❖ High-speed temporary storage areas
- ❑ Storage locations located within the CPU

- ❖ Work under direction of control unit
- ❑ Accept, hold, and transfer instructions or data
- ❑ Keep track of where the next instruction to be executed or needed data is stored

Memory

- The memory is that part of a computer that stores programs and data.

- modern computers are *digital* devices, meaning they store and process information as *binary digits (bits)*

- two values of a bit are written as 0 and 1, but the values could just as easily be represented as off and on, open and closed, volts and no volts, etc.

Memory

memory capacity is usually specified in bytes.

A *byte* is a collection of 8 bits, and thus is capable of representing $2^8 = 256$ different values

```
byte  --> 8 bits
kilobyte (KB)   --> 2^10 bytes  = 1,024 bytes  ( = 8,192 bits)
megabyte (MB)   --> 2^20 bytes  = 1,048,576 bytes  ( = 8,388,608 bits)
gigabyte (GB)   --> 2^30 bytes  = 1,073,741,824 bytes  ( = 8,589,934,592 bits)
```

Memory

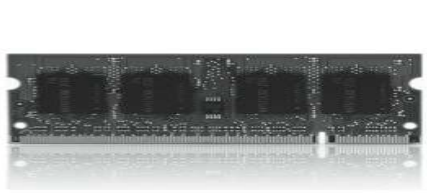
byte is sufficient to represent a single character

- a kilobyte can store a few paragraphs (roughly 1 thousand characters)
- a megabyte can store a book (roughly 1 million characters)
- a gigabyte can store a small library (roughly 1 billion characters)
- a terabyte can store a book repository (roughly 1 trillion characters)

Memory

- modern computers use a combination of memory types, each with its own performance and cost characteristics

- *Main memory* (or *primary memory*) is fast and expensive
- *Secondary memory* is slower but cheaper



RAM chips

Hard disk

Flash drive

Compact disk (CD)

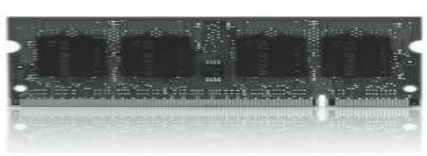
RAM VS ROM

- **RAM**: Random Access Memory
  2. Volatile
  3. Temporary storage
  4. Read and Write
  5. Allows the computer to read data quickly to run applications.
- **ROM**: Read only memory
  2. Non-volatile
  3. Permanent storage
  4. Read only
  5. Stores the program required to initially boot the computer.

Memory

- modern computers use a combination of memory types, each with its own performance and cost characteristics

- *Main memory* (or *primary memory*) is fast and expensive
- *Secondary memory* is slower but cheaper
  - use different technologies (magnetic signals on hard disk, reflective spots on CD)
  - non volatile
  - memory is permanent – useful for storing long-term data
  - examples: hard disk, flash drive, compact disk (CD)



RAM chips

Hard disk

Flash drive

Compact disk (CD)

Memory

- more main memory to allow for quick access to more data and programs
- more secondary memory to allow for storing more long-term data

Input/Output (I/O)

- **input devices** allow the computer to receive data from external sources
  - examples: keyboard, mouse, microphone, scanner

- **output devices** allow the computer to display or broadcast its results
  - examples: monitor, speaker, printer

Software

- *Software* : refers to the programs that execute on that hardware.

- A software program is a collection of instructions for the computer to carry out in order to complete some task

  e.g., word processing program, Web browser, Adobe Photoshop..

Operating Systems

Operating system (OS and O/S)

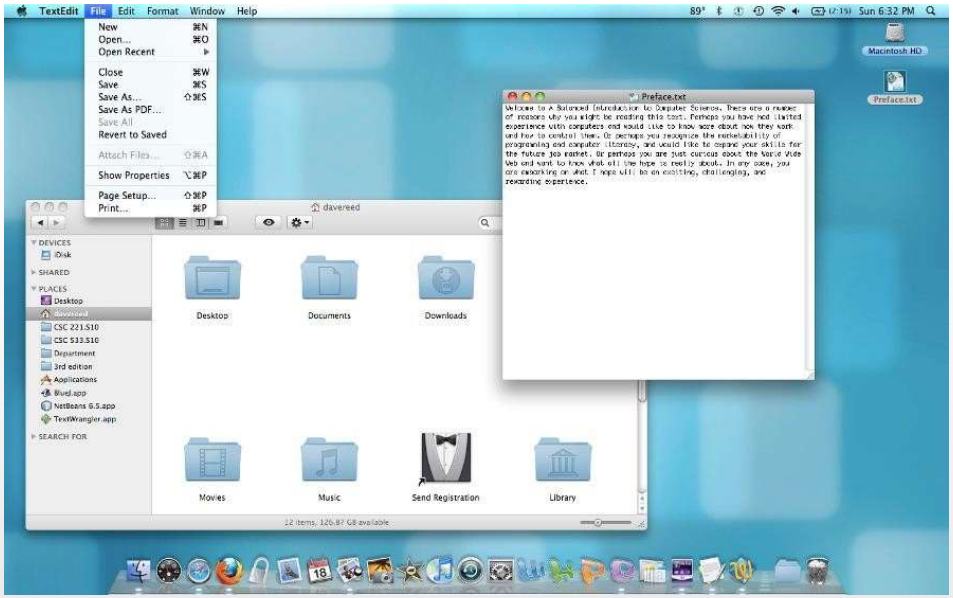
- is an interface between hardware and applications;

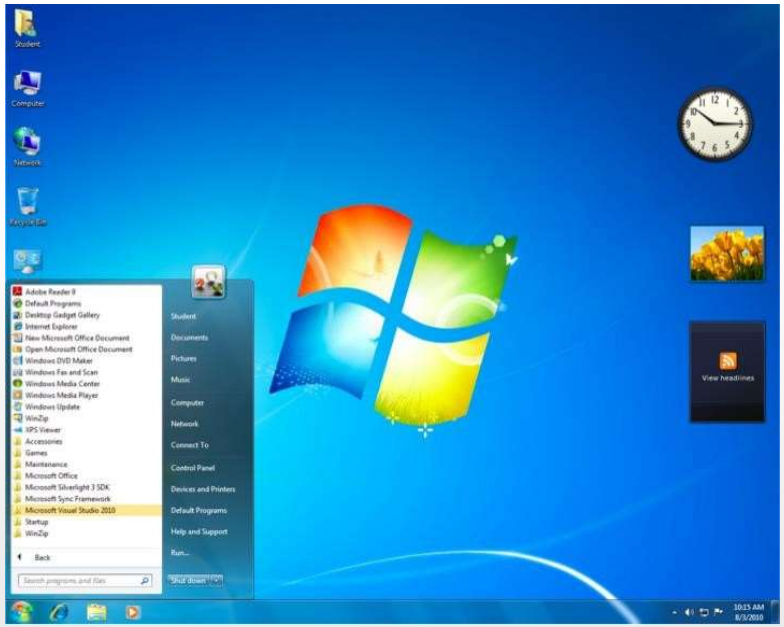
- it is responsible for the management and coordination of activities and the sharing of the limited resources of the computer.

Operating Systems (OS) Cont.

- Is a collection of programs that controls how the CPU, memory, and I/O devices work together
- manages the execution of all application programs, controlling how data and instructions are loaded into memory and accessed by the CPU.
- operating system provides an interface for the user to interact with the computer (GUI)

Operating System Cont.





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