Computer Science – Lecture 1

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Objectives of the Course

- To understand basic computer hardware
  - To describe the operation of some computer components
- To understand basic computer applications
  - To be able to use spreadsheets, web browsers and e-mail
- To create simple problem solving programs
  - By writing Pascal language programs

Approach

- Lectures
  - 1 hour per week
- Tutorials
  - As required
- Practicals
  - 2 hours per week
- Help & Information
  - Use Blackboard & e-mail

Assessments

- Programming assignments
  - Not assessed, some during practicals
- Test at end of Spring Term
  - 10% of Final Marks
- Practical Assessment
  - 20% of Final Marks

This Week

- Lecture
  - Basic components of a personal computer
- Practical
  - Use of e-mail
  - Use of Blackboard system

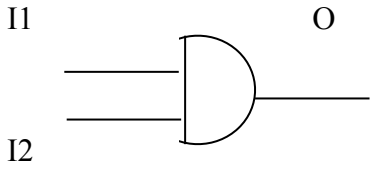
Gates

- A computer uses binary logic. A bit can have two values - a 0 or a 1 (off or on). One byte contains eight bits. Each byte represents one character of data - a letter, a digit or a special character.

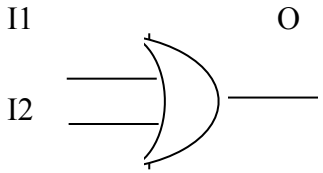
- A kilobyte (KB) represents 2^{10} or 1024 bytes. One megabyte (MB) is roughly a million bytes, that is, 2^{20} or 1048576 bytes. A gigabyte (GB) is roughly a billion bytes, that is, 2^{30} bytes

AND, OR and NOT Gates

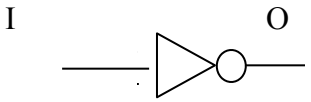
AND Truth Table		
I1	I2	O
0	0	0
0	1	0
1	0	0
1	1	1



OR Truth Table		
I1	I2	O
0	0	0
0	1	1
1	0	1
1	1	1

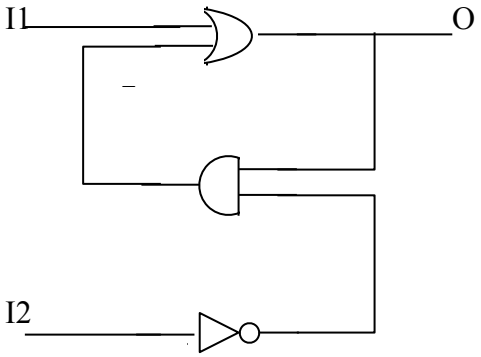


NOT Truth Table	
I	O
0	1
1	0



A Simple Flip-Flop

- **Maintains an output value (or a state) until an external input causes it to change value.**

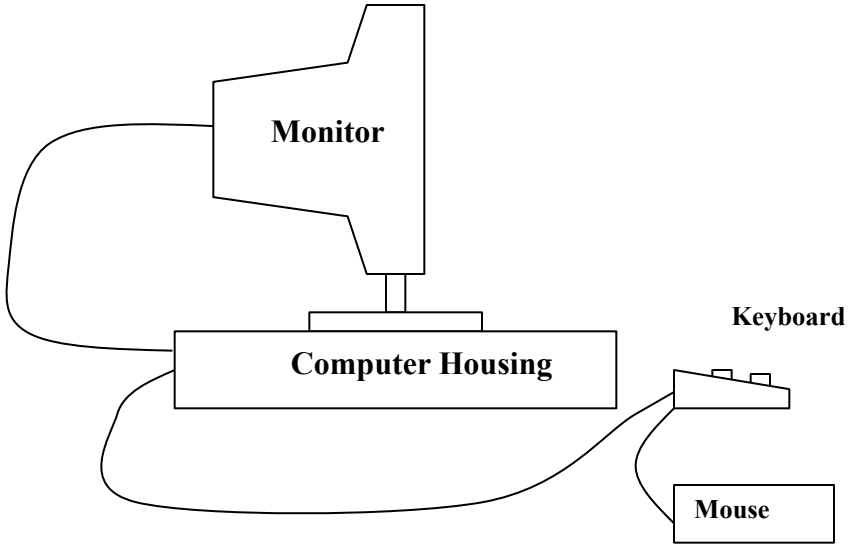


For example, given that O = 1

- **I1 =1, I2 = 0, O remains 1.**
- **I1 changes to 0, O remains 1.**
- **O becomes 0 when I2 becomes 1.**
- **Therefore change in I2 causes O to follow the value of I1.**

Basic Components of a Computer

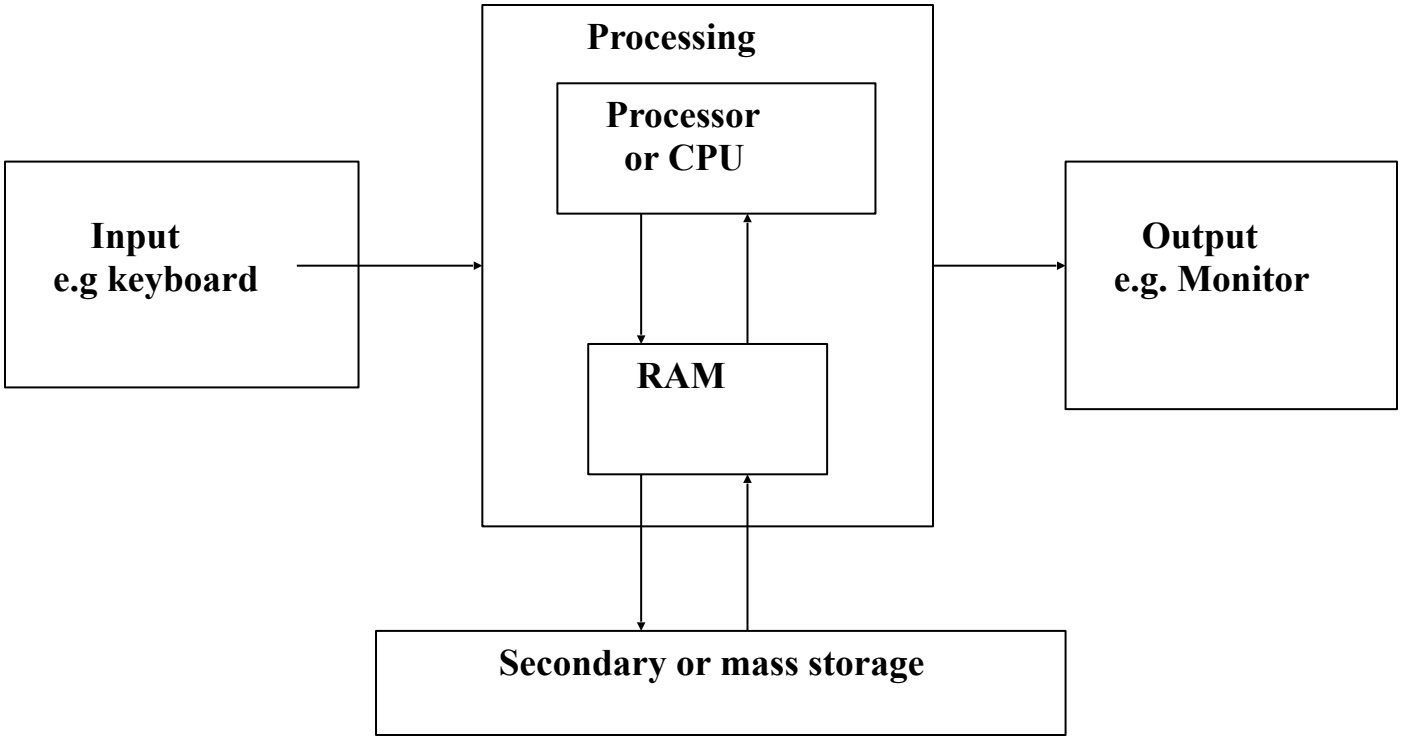
- **Personal Computer (PC) - A PC is a relatively small and inexpensive type of computer, usually used by an individual in a home or an office.**
- **The computer `housing' contains the Processor or CPU (Central Processor Unit), memory and storage devices, disk drives.**



Hardware and Software

- Hardware - this is the computer equipment
- Software - these are the instructions executed by the computer. A sequence of such instructions is called a program. The computer executes these instructions step-by-step.

Block Diagram of a Computer



Central Processor Unit (CPU)

- Modern PCs usually have an Intel microprocessor, for example, the Intel Pentium.
- The microprocessor speed is measured in MHz (megahertz) and can range from 100 to over 2000MHz. (Also known as 2GHz).
- The Processor is the `brain' of the computer and performs all computations.

Memory

- Memory holds information, that is, data and program instructions. Memory is measured in bytes. Putting data (or information) into memory is called `writing' to memory. Extracting or obtaining information from memory is called `reading' from memory.

- Memory is of two types: RAM and Secondary storage.

Random Access Memory (RAM)

- A typical PC will have 16MB, 32MB, 64MB or 128MB of RAM.
- A RAM loses all its information (memory is cleared) if the computer is switched off.
- You can expand the RAM at a later date is necessary.
- RAMs are semiconductor devices.

Secondary Storage

- Secondary storage holds more data - from several hundred megabytes to gigabytes.
- Secondary storage is usually magnetic disk, also known as a hard disk. This is fixed inside the PC.
- We can also store data onto a floppy disk or a special type of CD known as CD-R
  - We can then transfer the data to another computer

Input Devices

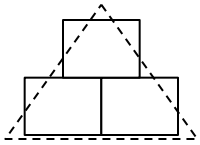
- Keyboard
- Mouse
- Scanner

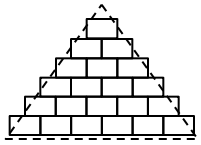
Output Devices

- Printers. There are many types of printers. Laser printers and ink-jet printers are very common.
- Monitors are 15-21 inches (measured diagonally) in size usually. A monitor with high resolution will have a clearer picture than one with low resolution.
- A low resolution monitor may have 800 columns and 600 rows of dots – each dot is called a pixel.
- A high resolution monitor may have up to 1280 x 1024 pixels. Pixels can millions of colours.

Screen Resolution

- Resolution defines the number of dots or pixels that can appear on the screen.
- In the figure below the picture on the right has better resolution as it gives a better more solid representation of a triangle.





Classification of Computers

- Supercomputers. These can process billions of instructions per second. Used for weather forecasting, aircraft design etc.
- Mainframes. These can process millions of instructions per second. Used by banks, insurance companies, airline reservations systems etc.
- Personal Computers. Used in offices and by individuals
- Laptops. A laptop computer fits into a briefcase and is portable. Same uses as a PC.
- Personal Digital Assistants hand held. A special pen allows input directly on the screen. Used for meter reading, nurses in hospitals etc.

Distributed System

- Not a Stand-alone computer.
- Example: A bank has input terminals at its branches (e.g. cash point cards). However all transactions may be computed at a centralised location. Information about customers may be stored at yet another location. The bank systems may therefore comprise several computers which can communicate with each other.
- The computers in the Department of Computer Science are all connected together through a Local Area Network (LAN). This allows users to send email to other users on the network, access data held in the computers on the network etc.

Software

Software is of two types:

- **Operating Systems. This is software that controls the computer.**
  E.g. Microsoft Windows

- **Applications Software. This is software used for specific applications such as for Word Processing (e.g. Microsoft Word), Spreadsheets, Databases etc.**