Objectives

At the end of this seminar and studio you should be able to:
1. Identify the components of a computer based system.

Seminar overview

- **Elements of computer systems:**
  - Hardware
  - Software
  - Data
  - (Networks)
  - Users

- **Types of computers:**
  - Museum of Computing History – a must see place!!

Computers are used to……

Input -> Process -> Store -> Output

V

Intermediate Store

- This model can be used for a steel plant, a car manufacturing plant, preparing a meal etc.

Elements of Computer Systems

- **Hardware**
  - The parts of a computer you see, pick up, use to input/output data

- **Software**
  - Operating systems
  - Applications

- **Data**

- **People / users**
  - The most important part of systems
Computer hardware [1]

Computers are a combination of many components and the combination of these components is often referred to as a system’s architecture. Computers contain at least:
- Motherboard,
- Processor or CPU
- Memory
- Storage devices
- Interface cards/drivers (video, printer, scanner)
- Peripheral devices

Computer hardware: The System Box

- The system box usually contains
  - A mainboard (or motherboard), on which is
    > The central processing unit (CPU) — the ‘brain’ of the computer where all the processing takes place
    > Memory [chips]
    > Connectors [BUS] for other devices
    > Power supply
    > Secondary storage devices
    > Communications devices such as modems, network cards etc

Secondary Storage

- Usually disk drives, usually hard disks
- “Random” access, must be [pre-] formatted
- Magnetic
- Read/Write heads must move
- Disks must spin [7200, 11200 rpm]
- These are not a fast medium
- Incredibly capable and reliable

Secondary storage: Optical media

- A series of pits and flats, reflecting a laser beam
- CD storage is about 700MB, single layer DVD is about 1.7GB [closer tracks, more frequent pits and flats]
- Read-Only is reliable
- Re-Writing is problematic
- Reading from a CD is slow [hence 52x readers]

How much storage?

- An A4 page of text is say 25 lines of 80 characters – say 2000 characters [2K]
- So 1000 pages [a ream, double-sided] is 2000K [2 Mbyte]
- So 1 Gbyte is 500 reams of paper [a stack about 125m high – think Rialto building]

How much storage do you need in your PC?

Computer peripherals

Peripherals are the components that are attached to the computer ‘box’. For example:
- Printer
- Keyboard, mouse, stylus
- Magnetic card reader
- Scanner
- Modem

Some peripherals may be added to the inside of the ‘box’ such as modem, storage devices, CD burners, infra-red devices (eg Palm Pilots)
Peripherals - input

- Keyboard, mouse, stylus
  - Multi-media and Web controls
  - Wireless-ness
- Scanner
  - Image quality & speed
  - Text scanner
- Voice
- Gesture

Peripherals - Output

- Monitor
  - CRT or LCD
- Printer
  - Laser or Ink-jet
- Speakers
  - Built-in, low quality or 6.1 hyper-reality [or headphones]

Computer software

- Operating Systems
  - There are many to choose from. e.g.
    > Windows [in its varieties]
    > UNIX [including Linux] [in its varieties]
    > OSX [a variety of UNIX]
- Systems software
- Application software

Operating systems

- Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers.
- The kernel controls the operating system and loads into memory nonresident operating system programs from disk storage as needed.
- Operating systems provide a software platform on top of which other programs, called application programs, can run.

Systems software

- Controls and monitors the activities and resources in a computer
- Three types:
  - System control software: manage resources e.g. memory
  - System support software: for efficient performance e.g. utilities, DBMS
  - System development software: help developers design and build better systems e.g. CASE tools
Application software

- Designed to perform people-related tasks or business applications e.g. payroll, inventory control, sales analysis.
- Two types:
  - **General purpose** for generic applications or general business functions e.g. email, word processing, spreadsheet, drawing.
  - **Dedicated or customised** to meet specific business information needs, e.g. Accounts receivable and payable, General ledger, Order entry and billing, Payroll, Inventory, Personnel.

Computer networks

A group of two or more computer systems linked together are known as 'networked'. There are many types of computer networks, including:
- **local-area networks (LANs)**: The computers are geographically close together (that is, in the same building).
- **wide-area networks (WANs)**: The computers are farther apart and are connected for example by telephone lines or radio waves.

**Computer networks [2]**

The following characteristics are also used to categorize different types of networks:
- **topology**: The geometric arrangement of a computer nodes (systems). Common topologies include a bus, star, and ring.
- **protocol**: The protocol defines a common set of rules and signals that computers on the network use to communicate. One of the most popular protocols for LANs is called Ethernet. Two if the protocols used for the internet is TCP and IP.
- **architecture**: Networks can be broadly classified as using either a peer-to-peer or client/server architecture.

**Computer networks [3]**

Telecommunications

- Data transmission, the data can be in many formats (text, voice, video, image).
- Bandwidth, the amount of data that can be transmitted in a fixed amount of time. For digital devices, the bandwidth is usually expressed in bits per second (bps). For analogue devices, bandwidth is expressed in cycles per second, or hertz (Hz).

Bandwidth

- A fast hard disk can be hampered by a bus with a low bandwidth.
- The greater the bandwidth the less time you have to wait for your data.

**Need to consider:**
- This graphic is 12KB.
- equal to a 200 word Word file
- equal to a 1500 word HTML file

Is a picture worth a thousand words?
Computer-based information systems

- The trick is to recommend the most appropriate computer system to meet the user requirements.
  - Hardware
  - Software
  - Data transmission - networks

Computers come in many shapes and sizes

Readings and references


http://www.whatis.com/
http://webopedia.com/
http://www.askjeeves.com
http://www.bigpond.com/broadband/

There are many books that give a good coverage of basic computer components.