Unit-1, Part-B

I101/B100
Problem Solving with Computers

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COMPUTERS AND CAREERS

Business, Arts, Healthcare, Law Enforcement, Legal Fields, Education, Sciences, Games, Homes, Sports
Data Mining
Computers in Business

- Where should detergents be placed in the Store to maximize their sales?
- Are window cleaning products purchased when detergents and orange juice are bought together?
- Is soda typically purchased with bananas? Does the brand of soda make a difference?
- How are the demographics of the neighborhood affecting what customers are buying?
Computers in Sports

- Training
- Timing and scorekeeping
- Data storage and statistics
- “Smartballs” sense when soccer goals are scored
Computers are used in every field that you can think of.
What are your options to learn computer science @ IUSB

- **Computer Science**  [www.cs.iusb.edu](http://www.cs.iusb.edu)
- **Informatics**  [www.informatics.iusb.edu](http://www.informatics.iusb.edu)

- MS in Applied Mathematics and Computer Science
- **BS in Computer Science**
- **BS in Informatics** (in-person and Online)
- **BS in Data Science**

- **Minor in Computer Science**
- **Minor in Computer Applications**
- **Minor in Informatics**
- Minor in Cognitive Science

- Certificate programs (computer applications, applied informatics, computer programming, advanced computer programming, technology for administration)
What is a Computer?

- An electronic **DIGITAL** device that can store, and process data.

- The computer accomplishes this task by using a **program**.
What is a Program?

- A plan to achieve a solution to a problem.
- A set of sequential instructions, which cause a computer to perform a particular operation or task.
Hardware vs. Software?

- **Hardware** is the actual circuitry and physical equipment of a computer system. **Hardware** is Tangible.

- **Software** is a sequence of instructions that are stored either magnetically or electronically. **Software** is non-tangible.
Components of a Computer System

- CPU (The Brain) (AKA Microprocessor)
- BUS (Central Nervous System) (Series of parallel wires, which allow various component to communicate with each other.)
- Memory (Storage) (ROM, RAM, Byte, Bit)
- Secondary (Storage) (Disks, Tapes) (Floppy, Hard disk, Flash memory, CD, DVD)
- Input Devices (Keyboard, Mouse)
- Output Devices (Display monitor, printer)
- Communication Devices
How is information represented inside the Computer?

- Binary digits or BITs (0’s and 1’s)

- Why Binary Digits?
How is information represented inside the Computer?

- Digital Computers are designed to process data in numerical form. They can store and manipulate information such as numbers, characters, images, and sound using **numbers**.

- The information inside the computer is expressed in the **binary system**.

- Binary digits (bits), are made up of **0’s and 1’s**. (e.g. 0, 1, 110, 11, 1010, and 1011 are all binary numbers).

- Binary digits are easily expressed in the computer circuitry by the **presence or absence of voltage**. For example 1 may mean 5 volts and 0 may mean 0 volts.
Digital vs. Analog?

- Analog systems have a continues range of values.
  - Vinyl records
  - Analog clocks
  - Set of real numbers

- Digital systems have a set of discrete values.
  - CD’s and DVD’s
  - Digital clocks
  - Set of integer numbers
Digital vs. Analog?

☐ Analog

☐ Digital
Digital vs. Analog?

☐ Analog

☐ Digital
Digital vs. Analog?

- Analog
- Digital
How do we represent English Characters inside the Computer?

- Characters are also represented using binary numbers.

- We use 8 bits to uniquely represent each character on the keyboard.

- The partial ASCII table (right) shows how characters are mapped into binary numbers.

- ASCII stands for (American Standard Code for Information Interchange)

<table>
<thead>
<tr>
<th>Decimal</th>
<th>Binary</th>
<th>Character</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>01000001</td>
<td>A</td>
</tr>
<tr>
<td>66</td>
<td>01000010</td>
<td>B</td>
</tr>
<tr>
<td>67</td>
<td>01000011</td>
<td>C</td>
</tr>
<tr>
<td>68</td>
<td>01000100</td>
<td>D</td>
</tr>
</tbody>
</table>
What about other languages?

- UNICODE is another standard used to represent characters other than English.

こんにちは
привет
你好
γειά σου
مرحبا
여보세요
hälsningar

ciao

Classes of Computers

- PCs (Personal Computer)
  - Relatively small used by one person at a time
- Tablets/Phones
  - Small, portable, low power use, touch interface
- Mainframe
  - Still larger
  - Requires support staff
  - Shared by multiple users
- Supercomputer
  - Very powerful mostly used for scientific computation
- Embedded Systems
  - Used in various devices (microwave, car, refrigerator, toaster!)
Computer Organization

Four major functions:
- Input data (gathers data)
- Processes data into information
- Outputs data or information
- Stores data and information
Computer Organization

- Five main components
  - Input devices
    - Allows communication to the computer
  - Output devices
    - Allows communication to the user
  - Main memory (RAM)
    - Memory locations containing the running program
  - Secondary memory
    - Permanent record of data often on a disk
  - Central Processing Unit (CPU) or Processor
    - Brain of the computer

![Diagram of main components of a computer]
Opening/Saving a File

Permanent

CPU Copies the file to RAM

Opens existing file

CPU Copies the file back to Disk

Saves the file

Edits the file

Volatile (RAM)
Hardware

- Things you can touch and feel in a computer or attached to a computer

- Printers
- Keyboard
- RAM
Ports

Entry & Exit Points

- CD/RW drive
- DVD/RW drive
- Memory card reader
- Productivity ports: audio, FireWire, USB
- Floppy drive (optional)
- Power button

- Serial ports
- USB ports
- Parallel port
- Ethernet and USB ports
- Audio ports
- Video ports
- Modem port
- FireWire ports
Inside a Computer

- Power supply
- Motherboard
- Adapter cards (such as sound card)
- CD drive
- Empty drive bay
- Indicator lights
- Floppy drive
- Zip drive
- Hard disk drive
Mother Board & Expansion Boards

- Memory modules (RAM)
- CPU
- Expansion cards
- Expansion slot