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
- Informatics  www.informatics.iusb.edu

- MS in Applied Mathematics and Computer Science
- BS in Computer Science
- BS in Informatics
- AS in Computer 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 continuous 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.

<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>

- ASCII stands for (American Standard Code for Information Interchange)
What about other languages?

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

こんにちは
привет
ciao
你好
γειά σου
こんにちは
privet
여보세요
ciao
你好
γειά σου
COMPUTER TYPES & ORGANIZATION
Classes of Computers

- PCs (Personal Computer)
  - Relatively small used by one person at a time
- Workstation
  - Larger and more powerful than a PC
- Mainframe
  - Still larger
  - Requires support staff
  - Shared by multiple users
- Supercomputer
  - Very powerful
- Embedded Systems
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
Opening/Saving a File

- **Permanent**
- **Opens existing file**
- **CPU Copies the file to RAM**
- **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