Chapter 0
Introduction
0.1 A Brief History of Computers

- What is a computer?
  - A mechanical or electronic device
  - Stores, retrieves, manipulates large amounts of information at high speed, with great accuracy
  - Does not need human intervention
  - Carries out instructions from a program
The Pioneers

- **Mid-1800’s**: Charles Babbage built the **Analytical Engine**
  - made from axles and gears that could store and process 40 digit numbers
  - assisted by Ada Byron who has a major programming language named after her (RAPTOR built on Ada)

- **1940**: Howard Aitken at Harvard, with John Atanasoff and Clifford Berry at Iowa State U. created **Mark I**, an electronic computer.
  - could not act on intermediate results.

- **1945**: John Mauchly and J. Presper Eckert at U. Pennsylvania built the **ENIAC** (Electronic Numerical Integrator and Calculator)
  - weighed 33 tons, 17,000 vacuum tubes
  - performed up to 5000 additions per second
ENIAC: the computer of the 1940’s!

Source: U.S. Army
Early Computers: 1940’s – 1950’s

1945 – 1950’s: First generation computers
- used vacuum tubes to do internal switching needed for computations
- 1955: about 300 computers in the world based on vacuum tubes
- Late 1950s: invention of the transistor was one of most important inventions of 20th Century
  - computers based on the transistor are the first solid-state computers
  - need climate-controlled environment
The Personal Computer

• 1970s: The personal computer becomes available with invention of the microchip

• 1974: The microchip, along with the invention of the microprocessor led to creation of first personal computer

• Bill Gates and Paul Allen founded Microsoft Corporation

• Stephen Wozniak and Steven Jobs founded Apple Computer, Inc.
Computers Today

- **Supercomputers** are very powerful and specialized and are used for massive computing problems by big corporations and government departments.
- **Mainframes** are in use at large corporations.
- **Desktop computers** and **Laptops:**
  - **PCs:** computers that use the Microsoft Windows operating system.
  - **Macs** compete with PCs in the personal computer market.
- **Smart phones:** the power of a computer combined with the lure of a cell phone.
- **Tablets:** all the features most users want in a computer combined with portability.
The Internet

**Internet** – a world-wide collection of networks
- **network**: 2 or more linked computers
- roots of the Internet: 1960’s, U.S. Defense Department project

**Email**: electronic mail

**WWW**: World Wide Web, originated 1989
- A vast collection of linked documents ([Web pages](#))

**Web2.0** – Social Networking
- consists of Web applications that facilitate information sharing, user-centered design, and collaboration
0.2 Computer Basics

Components of a computer
- **Central Processing Unit (CPU)**
- **Internal memory**
  - RAM (Random Access Memory)
  - ROM (Read Only Memory)
- **Mass storage devices**
  - Magnetic, optical, and solid-state and the Cloud
- **The system unit** houses the CPU, internal memory, and most mass storage
- **Input devices** such as keyboard and mouse
- **Output devices** such as monitor and printer
Central Processing Unit (CPU)

CPU is often called the brain of the computer
- Receives program instructions
- Performs arithmetic and logical operations
- Controls other computer components

Consists of millions of transistors on a single microchip that plug into the motherboard

Speed of CPU is measured in gigahertz (GHz)
Internal Memory (RAM and ROM)

**ROM**: read-only memory
- Contains instructions used by computer during startup
- Cannot be altered by computer user

**RAM**: random-access memory
- Is a “scratch pad” for user as he or she works
- Can be read from and written to
- RAM is measured in **megabytes** (MB) or **gigabytes** (GB)
Basic Units of Memory

- 1 bit (0 or 1)
- 1 byte normally consists of 8 bits
  - Is the storage for one character
- $2^{10}$ bytes $= 1024$ bytes $= 1$ kilobyte (KB)
- 1024 KB $= 1$ megabyte (MB)
- 1024 MB $= 1$ gigabyte (GB)
- Many people approximate in steps of 1000, not 1024
  - Example: a 20KB file actually has 20,480 bytes, not 20,000 bytes
Mass Storage Devices

Magnetic storage
- Hard disks are always internal but external hard disks may be added as supplemental storage

Optical storage
- CDs and DVDs

Solid-state storage
- Flash drives plug into a USB port

Cloud Computing
- Delivers computer services over the Internet with a host that provides service:
  - Infrastructure (hardware, servers, networking)
  - Platform (rent hardware, operating systems, storage, networking capacity)
  - Software (use software applications for a fee)
## Input and Output Devices

<table>
<thead>
<tr>
<th><strong>Input</strong></th>
<th><strong>Output</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>◦ Keyboard</td>
<td>◦ Monitor</td>
</tr>
<tr>
<td>◦ Mouse</td>
<td>◦ Printer</td>
</tr>
<tr>
<td>◦ digital pen</td>
<td>◦ Speakers</td>
</tr>
<tr>
<td>◦ Modem or wireless Internet connection</td>
<td>◦ modem or wireless Internet connection</td>
</tr>
<tr>
<td>◦ touch screen</td>
<td>◦ ...and more</td>
</tr>
<tr>
<td>◦ joy sticks</td>
<td></td>
</tr>
<tr>
<td>◦ Voice command</td>
<td></td>
</tr>
<tr>
<td>◦ ...and more</td>
<td></td>
</tr>
</tbody>
</table>
0.3 Software and Programming Languages

**Application Software**
- enhances productivity
- solves problems
- supplies information
- provides entertainment
- examples: word processors, database managers, spreadsheets, photo editors, browsers

**System Software: The Operating System**
- controls and maintains hardware
- communicates with user
- manages and communicates with applications
- examples: Windows, DOS, Linux, UNIX
Programming and Scripting Languages

Machine Languages
- Consists only of sequences of 0s and 1s
- example:
  0110110111110111
  0000000100000000
  0000001000000000

Assembly Languages
- symbolic representation of machine language
- example: ADD A,B

High-level Languages
- contains English words and phrases and algebraic expressions
- examples of high level languages:
  C++
  Objective C
  COBOL
  Java
  JavaScript
  Visual Basic

Scripting Languages
- Interpreted, not compiles
- Client-side (such as JavaScript)
- Server-side (such as PHP or ASP)
Writing Programs

To write a program in a high-level language, you need:

◦ appropriate software
◆ a text editor to type and edit program statements
◆ a debugger to help find errors in program code
◆ a compiler or interpreter to translate the program into machine language
Programming Logic

- All programming languages use basic programming logic.
- If you understand this logic, it will be much easier to learn any specific language.