CC-301 Programming Fundamentals

Lecture 1

Engr. Waseem Ullah Khan

Instructor Information

Instructor: Engr. Waseem Ullah Khan

Education:

- **B.Sc.** in Computer Systems Engineering, UET Peshawar (2018)
- **M.Sc.** in Computer Systems Engineering, UET Peshawar (2020)
  - Majors in M.Sc. Studies: Internet of Things and Cyber Security
- **Ph.D.** in Computer Systems Engineering, UET Peshawar (in progress)
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Course Information

Course Title: Programming Fundamentals

Course Code: CC-301

Credit Hours Theory: 3hr

Time Schedule:

- Lectures: Mondays, Wednesdays and Thursdays

Primary Textbook:

- Deitel and Deitel, *C++ How to Program,* 7th Edition
- Robert Lafore, *Object-Oriented Programming in C++,* 3rd Edition

Reference Textbook:

- Behrouz A. Forouzan, *A Structured Programming Approach Using C++*

Online Resources

Joining the Google Classroom is important:

- https://classroom.google.com/c/NjQ0NjY3MTc5OTMz?cjc=yqzwux3 (Class Code: ***yqzwux3***)

Online group benefits:

- Slides
- Assignments
- Announcements
- Course outline
- Discussions

Google Classroom

Teaching method:

- Combination of slides and white board
- Interaction about concepts encouraged

Tentative Grading Criteria

Assessment	Weightage (%age)
Attendance	5
Assignments	2.5
Quizzes	2.5
Mid Exam	20
Final Exam	70

All lectures interrelated:

- Each lecture provides base for next lecture
- Missing any lecture would result in problems in understanding subsequent lectures

Academic Honesty

Students to be awarded *'F'* grade if

- Collaborated excessively in individual tasks
- Found to have cheated e.g.
  - Copied or shared assignment
  - Copied during examination

IMPORTANT: PLAGIARISM CASES will be marked zero. If detected, "no justification" will be entertained. The student with the original solution will also be marked zero. Therefore, do care for your friends and don´t force them to "show" their solution as they will get zero as well. Contact me if anything is not clear.

Warning

No mobile phone usage during Lecture

General Discussion

Learning method (College vs University)

How many of you have a personal computer?

How many of you can install OS and other application softwares?

How many of you can do typing?

How many of you have email and social media accounts?

How many of you can troubleshoot PC?

Fundamentals of Computer Concepts

Computer

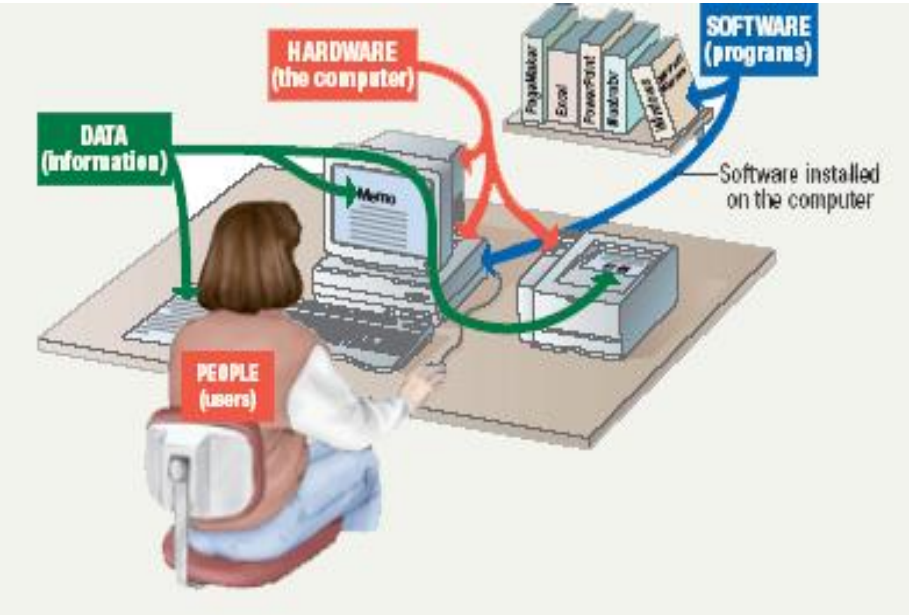
- A computer is a programmable, electronic machine that accepts data, (raw facts and figures) and process ,or manipulates, it into information

Information

- Processed data on a computer is called information

Building Blocks of computer system

- Data (Information)
- User
- Hardware
- Software



Hardware vs Software

Hardware

- Input Devices
- Output Devices
- CPU
- Memory
- Storage Devices







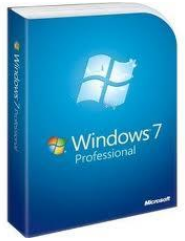




Software

- System Software
- Application Software



What is your level of expertise in Programming?

Why do we need a language?

To interact

To communicate

To simplify things

What are the basic elements of natural language?

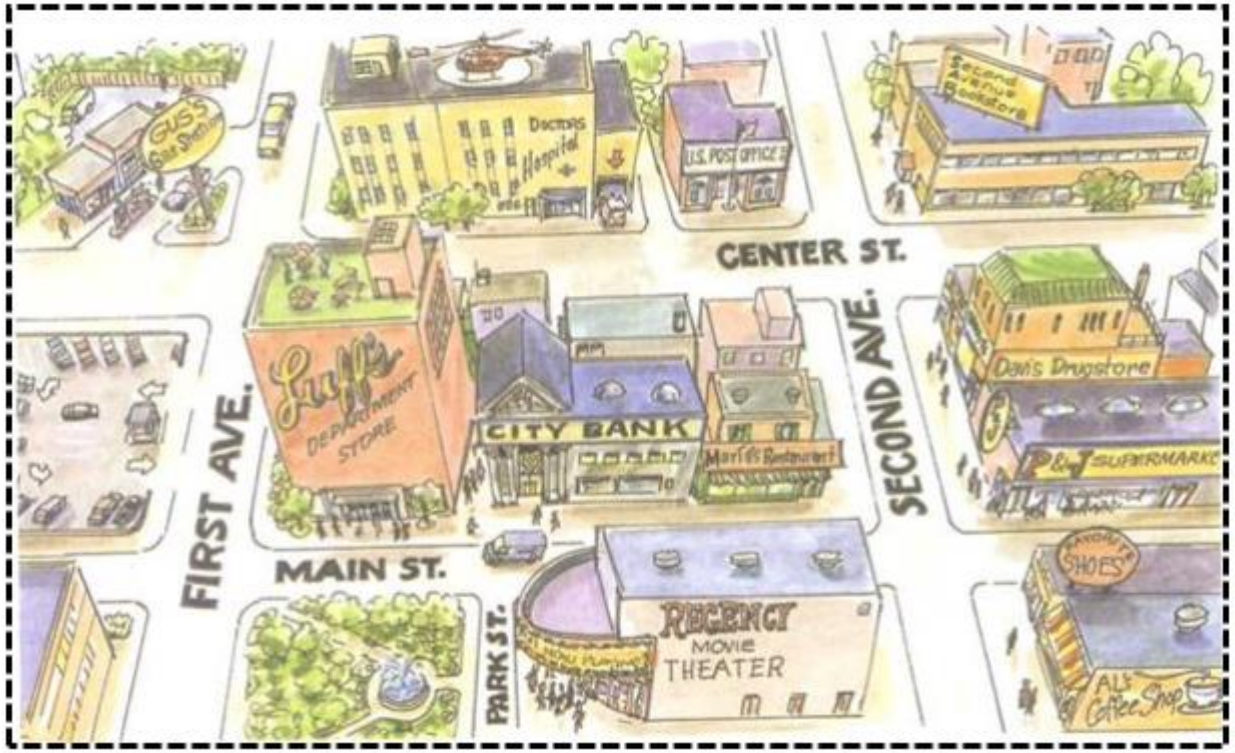
Different Languages: English, Spanish, German, French, Japanese, Urdu, Arabic and many more

Walk 10 feet in a straight line

- Cammina per 10 piedi in linea retta
- Camine 10 pies en línea recta
- Пройдите 10 футов по прямой

Why do we need a language?

Pick up the red pen and place it on the table



Walk 500 meter on First Ave and then turn right

Very precise instructions that will result in a single, expected outcome

Why do we need a programming language?

To interact with computers (generally electronic devices)

What is a programming language?

- Instructions to a computer to do something to accomplish a task
- Instructions for a specific task are encoded in a language
- A computer understands these instructions and performs the task

BUT what language does the computer understand?

Machine Language

Why do we need a programming language?

Computer only understands machine language

- Consists of 1s and 0s
- 1001011100001000

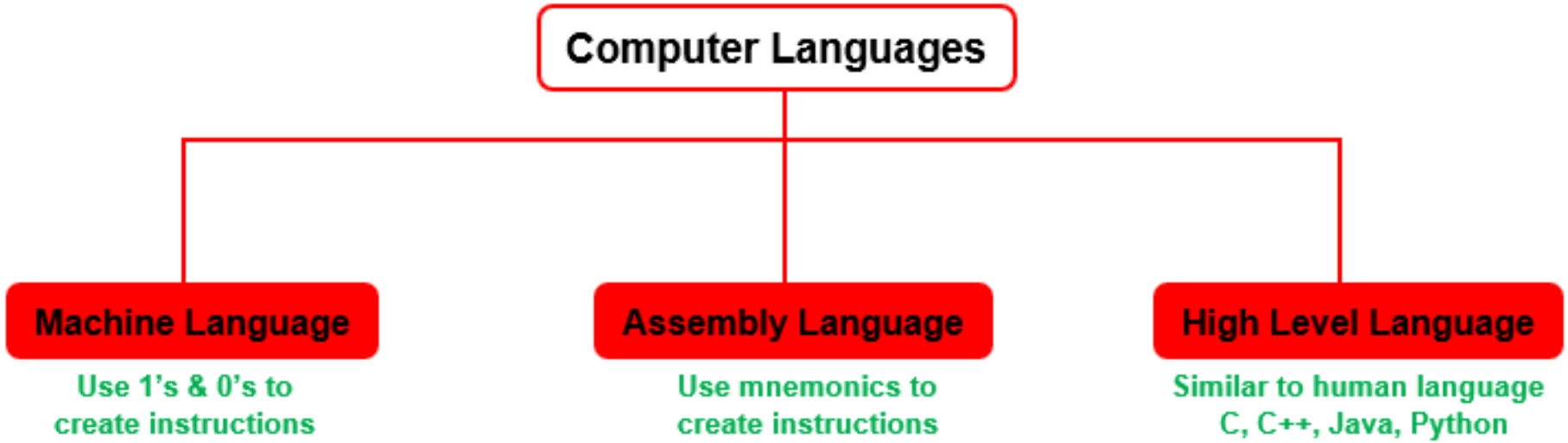
Initially all computers were programmed using machine language

- Difficult and cumbersome
- Only small programs can be written

Levels of Programming Languages

The levels of programming languages are:

- Machine Language
- Assembly Language
- High Level Language



The Ideal Way to Do Computing

The ideal way to ask computer to do something is to order it in a natural language e.g.

- I want to view this webpage
- Calculate my annual tax
- etc.

However, today's computer's are not intelligent enough to understand our orders in natural language completely

Where We Are in Computers?

At the very basic level computers use the concept of an electrical pulse

- Low voltage is represented as 0
- High voltage is represented as 1

To instruct a computer we need ask the computer in the language of 0s and 1s commonly known as ***machine language***

For instance, 73 in a number in natural language in the language of 0s and 1s, it becomes 1001001

Machine Language

Lowest Level: Machine codes

Directly process able, written in binary:

- 10001011
- 01100111
- 10011011
- 11000111

Hard to read, slow to create, fast to run

Assembly Language

One level above machine language is assembly language

Mnemonics directly represent machine code, Symbolic:

- INC A;
- ADD 2, 3;
- MOV NUM, AC;

Human readable, slow to create, fast to run

An **assembler** translates assembly language into machine language

High Level Language

High level: ‘C’, ‘C++’, Java, Python etc

One statement is equivalent of many machine code operations

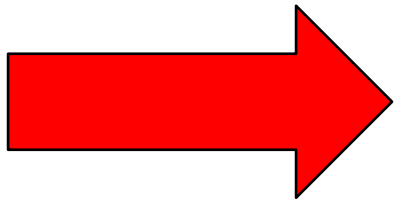
Human understandable, fast to run

A **compiler** or an **interpreter** is used to translate a high level program into executable machine code

```
#include <iostream>

int main()
{
 std::cout<<"HelloWorld";
 return 0;
}
```

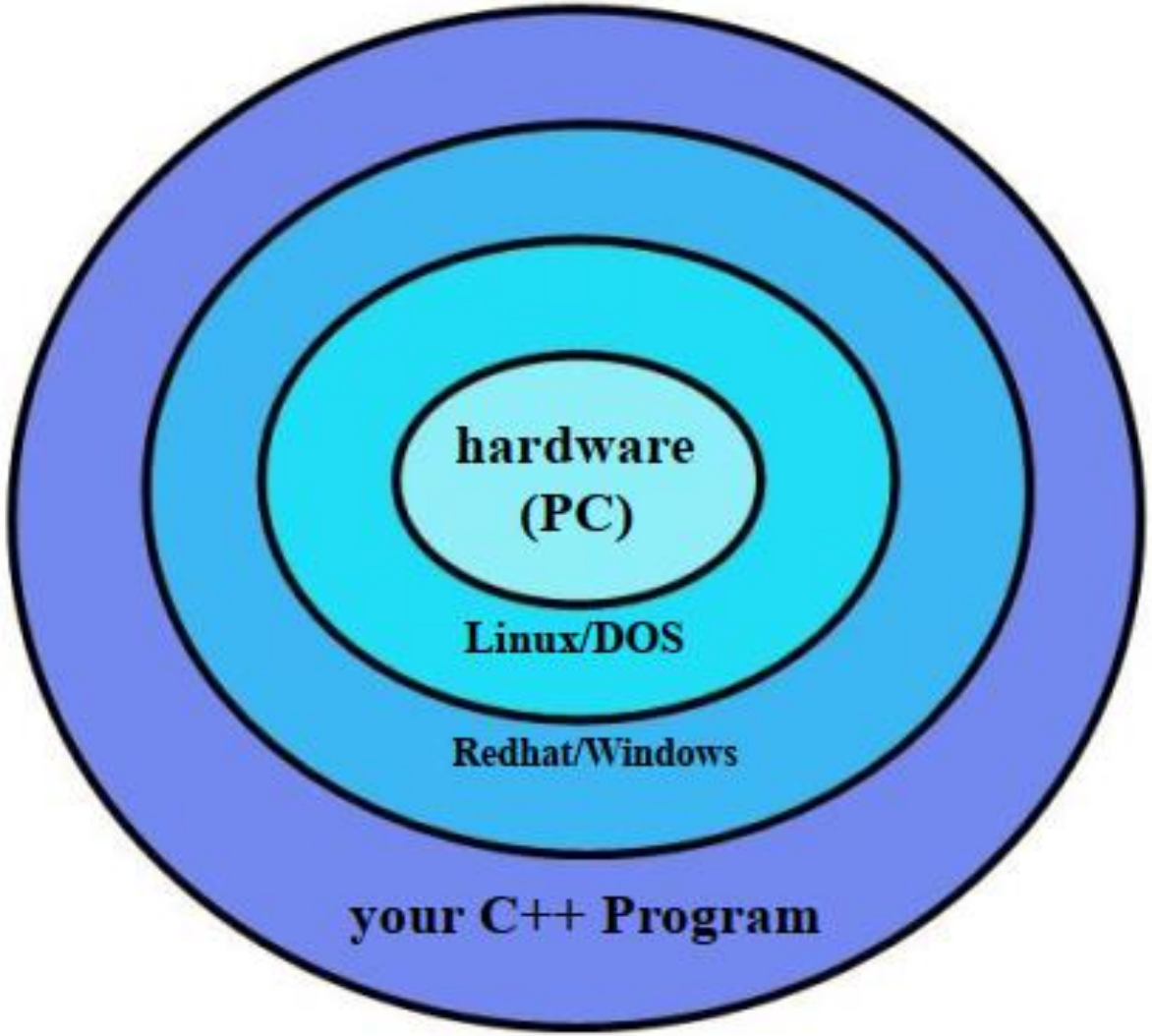
Source code



```
10100110 01110110
00100110 00000000
11111010 11111010
01001110 10100110
11100110 10010110
11001110 00101110
10100110 01001110
11111010 01100110
01001110 10000110
etc...
```

Executable code

The Computer Onion



C++ History

C developed by Dennis Ritchie at AT&T Bell Labs in the 1970s

- Used to maintain UNIX systems
- Many commercial applications written in c

C++ developed by Bjarne Stroustrup at AT&T Bell Labs in the 1980s

- Overcame several shortcomings of C
- Incorporated object oriented programming
- C remains a subset of C++

How to Learn Programming

Everybody learns programming at their own pace

So do not be impressed by the person sitting next to you because he coded a given program in 20 minutes and you are taking more than an hour

Speed programming does not necessarily mean quality of the final output

1. Writing a good description of the problem

2. Breaking down the given problem into small pieces

3. Turning small pieces into pseudo-code

4. Deciding the integration mechanism of the pieces

5. Writing the program for each piece

6. Integrating all the pieces together

Scare of Programming?

Why most students are afraid of programming

Paradigm Change

- Programming is totally different paradigm. You are working on something, and you cannot even touch the final output you can only feel it. It is different then other subjects like Physics, Chemistry, Biology, etc

Peer Pressure

- Some people are naturally good in programming so others think that this is a natural ability, and they cannot learn it

Scare of Programming?

Lack of Understanding in Fundamental Concepts

- Some people start programming without a clue of what is going on behind the scene in the computer. As a result, they have a flawed understanding from day one of their programming experience

Time Factor: Programming takes a lot of time

- Programming may take a lot of time at the start but once a person is comfortable with the concepts and has mastered the basic skills it is just like any other profession