

1. What is “Programming Language” ?

- Language : English, Korean, Japanese,
- Programming Language : FORTRAN, C, COBOL,....
 - Machine Language -> Assembly Language -> HLL -> Very HLL

2. Why study “Programming Language Concept” ?

- Helps to make the program that can be executed efficiently
- Helps to learn a new PL easily
 - Imperative Language : von-Neumann Computer
 - Declarative Language : Prolog, LISP, ...

3. What will we study in this Class ?

- Data : integer, char, float, array, structure, ...
- Control : if_then_else, for_loop, while_loop, switch, ...
- Subprogram : procedure vs. function, parameter passing, ...
- Object-Oriented Programming Concepts : abstract data type, object, message, inheritance, polymorphism, ...
- C++ : a Better C + OOP

C-like Language Program

```
main() {
    int i, j, k ;
    char a, b ;
    float f = 0.0;

    i = 65536; /* 216=65536 */
    for (i=100; i>100; i++) {
        f = f + i;
        f = f + f ;
    }
    i = 100; j = 200 ;
    swap(i, j);
}

swap (a, b) {
    int temp ;
    temp = a ;
    a = b;
    b = temp ;
}
```

▪ Which CPU ?

- ✓ 16-bit CPU
- ✓ 32-bit CPU

▪ Loop Control

- ✓ Pre_test
- ✓ Post_test

▪ Operator Overloading

▪ Inconsistent Type

- ✓ (warning) Error
- ✓ Coercion

▪ Parameter Passing

- ✓ Pass by value
- ✓ Pass by reference
- ✓ Pass by name

Concept of Programming Languages

Preliminaries
<ul style="list-style-type: none">- Why Study PL ?- Evaluation Criteria- Design Trade-offs



Basic Features (Variable, Expression, and Control)

Names, Binding, Type Checking, Scope

- Variables, Binding
- Type Checking
- Scope, Lifetime

Data Types

- Primitive Types
- Ordinal Types
- Array, Record
- Union, Set, Pointer

Expression & Assignment

- Arithmetic Exp.
- Overloaded Op.
- Type Conversion
- Assignment Stmt

Statement-Level Control Structures

- Compound Stmt, Selection Stmt
- Iterative Stmt, uncond. Branching
- Guarded Commands



Subprograms

Subprograms

- Parameter Passing
- Overloaded Subpgm, Generic Subprg

Implementing Subprogram

- FORTRAN 77
- Algol-like Lang.



Advanced Features

Abstract Data Type

- Abstraction
- Encapsulation, Abstract Data Type

Concurrency

- Coroutine
- Semaphore, Monitor
- Message Passing

Exception Handling

- Concepts
- P/I/, Ada, C++



Non-Imperative Languages

Functional
Programming
Languages

Logic
Programming
Languages

Object-Oriented
Programming
Languages