Lecture 0 – Course Overview

COSE212: Programming Languages

Jihyeok Park

2023 Fall

Course Information

PLRG

- **Instructor:** Jihyeok Park (박지혁)
  - **Position:** Assistant Professor in CS, Korea University
  - **Expertise:** Programming Languages, Software Analysis
  - **Office hours:** 14:00–16:00, Tuesdays (appointment by e-mail)
  - **Office:** 609A, Science Library Bldg
  - **Email:** jihyeok_park@korea.ac.kr

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- **Class:** COSE212 - 02 (English) - **Only for CS students**

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- This is **NOT** an introductory course. You should have a **strong understanding** of introductory computer science courses. (i.e., OOP, theory of computation, discrete mathematics, and data structures)

Schedule

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Weak	Contents
1	Introduction
2	Syntax and Semantics
3	Identifiers and First-Order Functions
4	First-Class Functions and Recursion
5	Mutable Variables
6	Garbage Collection
7	Lazy Evaluation
8	**Midterm Exam (Oct. 25 - Wed.)**
9	Continuations
10	First-Order Representation of Continuations
11	Type Systems
12	Type Inference
13	Algebraic Data Types
14	Parametric Polymorphism
15	Subtype Polymorphism
16	**Final Exam (Dec. 20 - Wed.)**

Grading

PLRG

- **2–4 Homework Assignments: 20%**
  - Programming assignments (submission in **Blackboard**)
  - You can utilize or refer to any other materials (e.g., ChatGPT), but you **MUST** write your **OWN** solution.
  - Cheating is strictly prohibited. Cheating will get you an F.

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- **Midterm exam: 30%**
  - October 25 (Wed.) 13:30 – 14:45 (in class, 75 min.)

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- **Midterm exam: 30%**
  - October 25 (Wed.) 13:30 – 14:45 (in class, 75 min.)
- **Final exam: 40%**
  - December 20 (Wed.) 13:30 – 14:45 (in class, 75 min.)

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- **Midterm exam: 30%**
  - October 25 (Wed.) 13:30 – 14:45 (in class, 75 min.)
- **Final exam: 40%**
  - December 20 (Wed.) 13:30 – 14:45 (in class, 75 min.)
- **Attendance: 10%**
  - Please use **Blackboard** to attend the class **by yourself**.

Course Materials

- **Self-contained lecture notes.**

  https://plrg.korea.ac.kr/courses/cose212/

  (Special thanks to Prof. **Sukyoung Ryu** @ KAIST)

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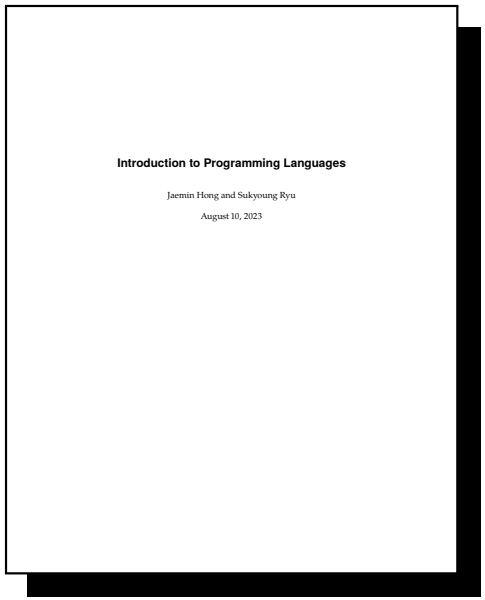
  (Special thanks to Prof. **Sukyoung Ryu** @ KAIST)
- **Reference: "Introduction to Programming Languages"** written by Jaemin Hong and Sukyoung Ryu



https://hjaem.info/itpl

Goal of This Course

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Learn **Essential Concepts** of **Programming Languages**

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- Why?

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  - To **learn new programming languages** quickly.

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  - To **evaluate** and pick the best language for a given task.

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Learn **Essential Concepts** of **Programming Languages**

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  - To design a **specialized language** for a specific task.

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- Why?
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- How?

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- How?

By Implementing **Interpreters** using **Scala**

- You will learn how to define **syntax** and **semantics** of target languages.
- You will implement **interpreters** of the target languages.
- You will use **Scala** as an implementation language.

Interpreters vs Compilers

- An **interpreter** takes and executes a program to produce the result.

  - Good for **understanding** program behavior, easy to **implement**.
  - For example, `scala`, `python`, `bash`, desktop calculator, etc.
  - You will implement interpreters of various languages in this course.

Interpreters vs Compilers

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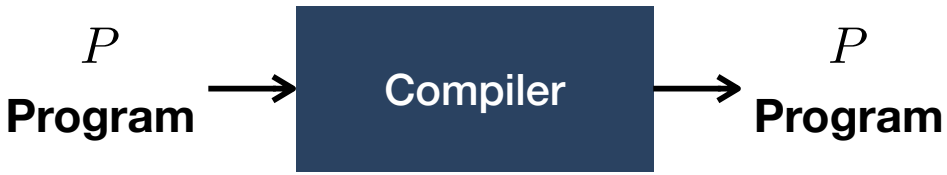
- A **compiler** takes a program and produces another program.



  - Good for **speed**, but more **complex**.
  - For example, `scalac`, `gcc`, `javac`, etc.
  - If you're interested in compilers, take **COSE312: Compilers**.

Roadmap: Growing a Language

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We will grow a language step by step from a simple arithmetic language to a complex language with various features.

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- **Part 1: Untyped Languages**
  - Syntax, Semantics, Identifiers
  - **Functional** – Functions, Closures, Recursion
  - **Imperative** – Mutation, Sequences, Garbage Collection
  - **Advanced** – Lazy Evaluation, Continuations

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  - **Advanced** – Lazy Evaluation, Continuations

- **Part 2: Typed Languages**
  - **Type Systems** – Types, Typing Rules, Typed Languages
  - **Type Inference** – Type Variables, Type Unification
  - **Algebraic Data Types** – Variants, Pattern Matching
  - **Polymorphism** – Parametric Polymorphism, Subtype Polymorphism

Next Lecture

- Basic Introduction of Scala

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