Lecture 0 – Course Overview

COSE212: Programming Languages

Jihyeok Park

2025 Fall

Course Information

- **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:** 507, Jung Woonoh IT & General Education Center
  - **Email:** jihyeok_park@korea.ac.kr

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- **Teaching Assistant:**
  - Seongmin Ko (고성민) – 2018320221@korea.ac.kr
  - Hyunjoon Kim (김현준) – rickykhj@korea.ac.kr
  - Minseok Choe (최민석) – goro8pyo@korea.ac.kr

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- **LMS:** https://lms.korea.ac.kr/
  - Please use the **Board** > **Q&A** section for questions.

Grading

- **4 Homework Assignments: 30%**
  - Programming assignments in Scala (submission in **LMS**)
  - Please check the course website for the detailed **policy on academic integrity**. Some highlights are:
    - Do not share your code with others / use others' code.
    - It's your code only if you can explain it in detail.
  - If violated, you get a **zero** for the assignment or an **F for the course**.

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- **Midterm exam: 30%**
  - October 22 (Wed.) 18:30 – 21:00 (150 min.)
  - In classroom, closed book, closed notes
- **Final exam: 30%**
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- **Attendance: 10%**
  - Please use **LMS** to attend the class **by yourself**.

Schedule

Weak	Contents	Weak	Contents
1	Introduction	9	Continuations
2	Syntax and Semantics	10	First-Class Continuations
3	Identifiers and First-Order Functions	11	Type Systems
4	First-Class Functions and Recursion	12	Algebraic Data Types
5	Mutable Variables	13	Parametric Polymorphism
6	Garbage Collection	14	Subtype Polymorphism
7	Lazy Evaluation	15	Type Inference
8	**Midterm Exam (Oct. 22 - Wed.)**	16	**Final Exam (Dec. 17 - Wed.)**

On the four days listed below, there will be no offline lectures.

- Oct. 5 (Mon.) / 7 (Wed.) – 추석
- Nov. 17 (Mon.) / 19 (Wed.) – International Conference

Instead, lecture videos will be uploaded to **LMS**.

Course Materials

- **Self-contained lecture notes.**

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

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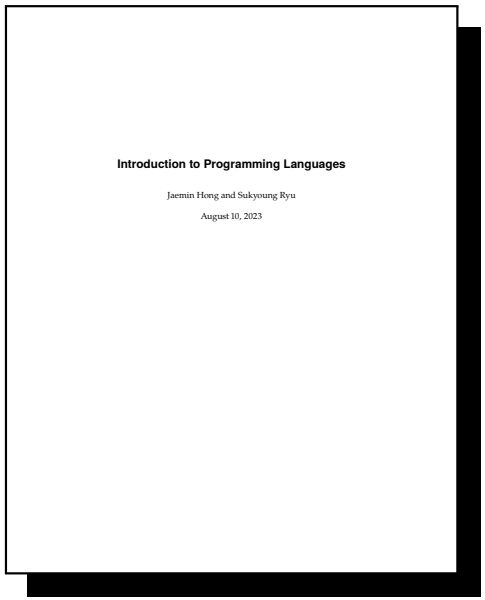
- **Reference: "Introduction to Programming Languages"** written by Jaemin Hong and Sukyoung Ryu



https://hjaem.info/itpl

Goal of This Course

PLRG

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- Why?

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  - **learn new programming languages** quickly.
  - **evaluate** and pick the best language for a given task.
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- How? You will learn how to:
  - **design** programming languages in a **mathematical** way.
  - **implement** their **interpreters** using **Scala**.

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- Why? After this course, you will be able to:
  - **learn new programming languages** quickly.
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  - **design** your own **specialized languages** for specific tasks.
- How? You will learn how to:
  - **design** programming languages in a **mathematical** way.
  - **implement** their **interpreters** using **Scala**.
- However, note that:
  - You will **NOT learn** particular programming languages.
  - You will **NOT learn** how to write programs in those languages.
  - This is **NOT** an introductory course. You should have a **strong understanding** of introductory computer science courses. (i.e., theory of computation, discrete mathematics, and data structures)

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.

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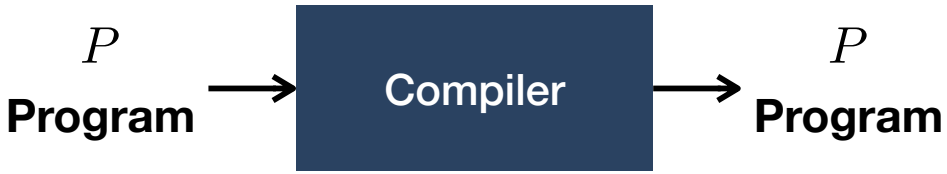
- A **compiler** takes a program and produces another program.



  - 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

PLRG

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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  - **Functional** – Functions, Closures, Recursion
  - **Imperative** – Mutation, Sequences, Garbage Collection
  - **Advanced** – Lazy Evaluation, Continuations

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

Next Lecture

- Basic Introduction of Scala

Jihyeok Park
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https://plrg.korea.ac.kr