

Lecture 0 – Course Overview

COSE212: Programming Languages

Jihyeok Park



2026 Fall

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 - **Position:** Assistant Professor in CS, Korea University
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- **Class:** COSE212 - 02 (English)
 - 13:30–14:45, Mondays and Wednesdays
 - 610, Jung Woonoh IT & General Education Center
- **Homepage:** <https://plrg.korea.ac.kr/courses/cose212/>
- **LMS:** <https://lms.korea.ac.kr/>
 - Please use the **Board** > **Q&A** section for questions.
- **Teaching Assistants:** cose212@googlegroups.com
 - Please contact the TAs via the group e-mail above.

If **AI** writes the code, why learn the **language**?

- **AI Writes Code; We Read & Verify**

To check that generated code captures our **intent**, we must know precisely what it **means** (its **semantics**).

- **The Need for Formal Semantics**

AI is **probabilistic**, so the guarantee must come from the language itself – defined **mathematically**, not by intuition.

- **Treating Programs as Data**

Understanding a language lets us handle programs as **data** – so we can **analyze**, **verify**, **modify**, and **compile** them.

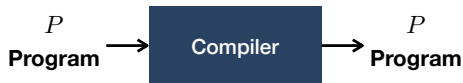
To learn **essential concepts** of **programming languages**

- **What you will achieve:**
 - **Read** any program and say precisely what it **means**.
 - **Evaluate** and pick the right language for a task, or **design** your own.
- **How we will do it:**
 - **Design** languages with their **formal semantics**.
 - **Implement** their **interpreters** in Scala, treating programs as data.
- **What this course is NOT:**
 - You will **NOT** learn **specific languages**.
 - This is **NOT** an introductory course; it assumes discrete mathematics, data structures, and theory of computation.

- 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.
- 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**.

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

- **Part 1: Untyped Languages**

- Syntax, Semantics, Identifiers
- **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

- **3 Projects: 0%**
 - You will implement **three** different mini languages: MiniFSharp, MiniPython, and MiniScala.
 - They are **NOT graded** and need **no submission**.
 - However, some exam questions might be related to them, so we **strongly recommend** solving them by yourself.
- **Midterm exam: 45%**
 - October 21 (Wed.) 18:30 – 21:00 (150 min.)
 - In classroom, closed book, closed notes
- **Final exam: 45%**
 - December 16 (Wed.) 18:30 – 21:00 (150 min.)
 - In classroom, closed book, closed notes
- **Attendance: 10%**
 - Please use [LMS](#) to attend the class with the code provided.
 - **All or nothing:** $\geq 2/3$ of the checks $\rightarrow$ **10%**, otherwise **0%**.
 - **No attendance check** in the first week; it starts on **Sep. 7**.

Week	Contents	Week	Contents
1	Course Overview	9	Continuations
2	Scala, Syntax and Semantics	10	Continuations, First-Class Cont.
3	Syntax and Semantics, Identifiers	11	Compiling with Cont., Type Systems
4	Identifiers, First-Order Functions	12	Typed Languages, Typing Recursion
5	First-Class Functions, Lambda Calc.	13	Algebraic Data Types
6	Recursion, Mutable Data Structures	14	Parametric and Subtype Polymorphism
7	Mutable Variables, Garbage Collection	15	Type Inference
8	Lazy Evaluation, Midterm (Oct. 21)	16	Course Review, Final (Dec. 16)

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

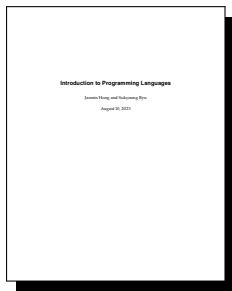
- Oct. 5 (Mon.) / 7 (Wed.) – International Conference
- Oct. 12 (Mon.) / 14 (Wed.) – International Conference

Instead, lecture videos will be uploaded to [LMS](#), and you don't need to check the attendance on these days.

- **Self-contained lecture notes.**

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

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



<https://hjaem.info/itpl>

- Basic Introduction of Scala

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