


# Extended Syllabus

(The details of the syllabus are subject to change)

Course Title	Fundamentals of Compiler Construction (기초컴파일러구성)	Semester	2 <sup>nd</sup> Semester, 2024
Credit	3	Course Number	CSE4120
Class Time	Wed/Fri 15:00~16:15	Enrollment Eligibility	3 <sup>rd</sup> ~4 <sup>th</sup> grade (recommended)

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	Office: AS 711 Office hour: Will be announced in the first class	

## I. Course Overview

### 1. Description

In this course, students will learn about the design and implementation of compiler. The course will mainly focus on the first two phases of a compiler: (1) front-end (for parsing) and (2) middle-end (for optimization). The back-end (code generation) part will be briefly covered at the end of the course. Students will implement their own compiler during the course project.

### 2. Prerequisites

Although there is no **mandatory prerequisite course**, the course will be easier if you are familiar with various fields of computer science. For instance, the front-end of a compiler is closely related to **automata theory**, and the middle-end is closely related to **programming languages**.

In this course, you will learn and use **F#** for the project. The course will provide a tutorial and exercise for **F#**, so it is okay even if you have not used it before. However, you must have sufficient programming experience.

### 3. Course Format

Lecture	Discussion	Experiment	Field study	Presentation
100 %				

### 4. Evaluation (tentative)

Midterm Exam	Final Exam	Assignment	Project	Participation
35%	20%	10%	35%	

## II. Course Objectives

By learning the fundamental principles of a compiler, students will learn how a programming language is internally implemented. Also, the students will get familiar with program analysis theories by exploring the optimization techniques of a compiler. Lastly, the projects will provide students with an opportunity to practice developing large and complex software.

## III. Course Format

Every week we will have two lectures. The lecture will cover fundamental principles about compiler. This course has several challenging projects, and sometimes the lecture will give you advices and feedback on these projects.

## IV. Course Requirements and Grading Criteria

There is no requirement for completing this course, as long as you don't get FA. Cut-off lines for each grade will be decided during the semester, considering the difficulty of exams and projects.

## V. Course Policies

As the course mainly relies on lecture, it is strictly prohibited to disrupt the class (for example, by chatting loudly with your friends or wandering around during the class). And the course will follow the attendance policy of Sogang University.

Cheating in the exam will result in immediate **F** grade. Code copy is also strictly forbidden, and you will get zero point and your final letter grade will be downgraded (e.g., **A** -> **B**).

## VI. Materials and References

The course will primarily rely on the lecture notes provided from the course. Interested students may refer to *"Compilers: Principles, Techniques, and Tools"* to deepen their understanding, but it is not mandatory.

## VII. Course Schedule (subject to change)

For all of the weeks, (1) the class method will take lecture format, and (2) the lecture notes uploaded in *Cyber Campus* will be used as the class material.

Week 1	Learning Objectives	Learn the overall structure of a compiler
	Topics	9.4 Orientation / 9.6 Course topic overview
	Assignments	
Week 2	Learning Objectives	Learn the background for lexical analysis
	Topics	9.11 Regular expression / 9.13 Non-deterministic FA
	Assignments	
Week 3	Learning Objectives	Learn the key principles of lexical analysis
	Topics	9.18 No class (Chuseok) / 9.20 Deterministic FA
	Assignments	
Week 4	Learning Objectives	Learn the background for lexical analysis
	Topics	9.25 Context-free grammar / 9.27 No class (Sogang festival)
	Assignments	
Week 5	Learning Objectives	Learn the key principles of syntax analysis
	Topics	10.2 Top-down parsing / 10.4 Top-down parsing (cont.)
	Assignments	
Week 6	Learning Objectives	Learn the key principles of syntax analysis
	Topics	10.9 No class (Hangul Day) / 10.11 Bottom-up parsing *Make-up class (recorded video lecture): Parser generator
	Assignments	Assignment #1: Lex (Flex) & Yacc (Bison)
Week 7	Learning Objectives	Learn the advanced topics of syntax analysis
	Topics	10.16 & 10.18 Bottom-up parsing (cont.)
	Assignments	

<b>Week 8</b>	<b>Midterm exam period (10.21 – 10.25)</b>	
<b>Week 9</b>	<b>Learning Objectives</b>	<b>Prepare the course project</b>
	<b>Topics</b>	<b>10.30 Exam review, F# tutorial / 11.1 Project overview</b>
	<b>Assignments</b>	<b>Assignment #2: F# exercise</b>
<b>Week 10</b>	<b>Learning Objectives</b>	<b>Learn the key principles of type checking for C-like languages</b>
	<b>Topics</b>	<b>11.6 Type checking / 11.8 Project phase #1 guide</b>
	<b>Assignments</b>	<b>Project phase #1: Type checking</b>
<b>Week 11</b>	<b>Learning Objectives</b>	<b>Learn the key principles of IR generation</b>
	<b>Topics</b>	<b>11.13 IR generation / 11.15 Project phase #2 guide</b>
	<b>Assignments</b>	<b>Project phase #2: IR generation</b>
<b>Week 12</b>	<b>Learning Objectives</b>	<b>Learn the background for IR-level optimization</b>
	<b>Topics</b>	<b>11.20 Basics of optimization / 11.22 No class (entrance exam)</b>
	<b>Assignments</b>	
<b>Week 13</b>	<b>Learning Objectives</b>	<b>Learn the key principles of IR-level optimization</b>
	<b>Topics</b>	<b>11.27 &amp; 11.29 Various optimizations (CP, DCE, Mem2Reg, etc.)</b>
	<b>Assignments</b>	<b>Project phase #3: Optimization</b>
<b>Week 14</b>	<b>Learning Objectives</b>	<b>Learn the advanced topics of IR-level optimization</b>
	<b>Topics</b>	<b>12.4 Advanced optimizations / 12.6 Backup class (TBD) *Make-up class (recorded video lecture): Register allocation</b>
	<b>Assignments</b>	
<b>Week 15</b>	<b>Learning Objectives</b>	<b>Review the topics covered in the course</b>
	<b>Topics</b>	<b>12.11 Final exam / 12.13 Exam review, course wrap-up</b>
	<b>Assignments</b>	
<b>Week 16</b>	<b>Final exam period (12.16 – 12.20)</b>	

## VIII. Special Notes

Course announcements will be made in Cyber Campus (cyber.sogang.ac.kr).

## IX. Aid for the Challenged Students

The instructor will sincerely respond to the request from *Support Center for Students with Disabilities* (장애학생지원센터). Students with disabilities may also contact the instructor and ask for helps, such as an allocation of a front seat.