

CS-420

Advanced compiler construction

Schinz Michel

Cursus	Sem.	Type
Computer science	MA2, MA4	Opt.
Cybersecurity	MA2, MA4	Opt.
Data Science	MA2, MA4	Opt.
SC master EPFL	MA2, MA4	Opt.

Language of teaching	English
Credits	6
Session	Summer
Semester	Spring
Exam	During the semester
Workload	180h
Weeks	14
Hours	4 weekly
Lecture	2 weekly
Project	2 weekly
Number of positions	

Summary

Students learn several implementation techniques for modern functional and object-oriented programming languages. They put some of them into practice by developing key parts of a compiler and run time system for a simple functional programming language.

Content

Part 1: implementation of high-level concepts

- functional languages: closures, continuations, tail call elimination,
- object-oriented languages: object layout, method dispatch, membership test.

Part 2: optimizations

- compiler intermediate representations (RTL, SSA, CPS),
- inlining and simple optimizations,
- register allocation.

Part 3: run time support

- interpreters and virtual machines,
- memory management (including garbage collection).

Keywords

compilation, programming languages, functional programming languages, object-oriented programming languages, code optimization, register allocation, garbage collection, virtual machines, interpreters, Scala.

Learning Prerequisites**Recommended courses**

CS-320 Computer language processing

Important concepts to start the course

Excellent knowledge of Scala and C programming languages

Learning Outcomes

By the end of the course, the student must be able to:

- Assess / Evaluate the quality of a compiler intermediate representation
- Design compilers and run time systems for object-oriented and functional programming languages
- Implement rewriting-based compiler optimizations
- Implement efficient virtual machines and interpreters
- Implement mark and sweep or copying garbage collectors

Teaching methods

Ex Cathedra, mini-project

Assessment methods

Continuous control (mini-project 80%, final exam 20%)

Supervision

Office hours	No
Assistants	Yes
Forum	Yes

Resources

Virtual desktop infrastructure (VDI)

No

Bibliography

The Garbage Collection Handbook - The Art of Automatic Memory Management, second edition, Richard Jones, Antony Hosking, Eliot Moss (ISBN 9781032218038).

Ressources en bibliothèque

- [The Garbage Collection Handbook / Jones](#)

Websites

- <https://cs420.epfl.ch/>