

Concepts of Programming Languages

Master Course - Hochschule Rosenheim - WS 2018/2019

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A word cloud of programming languages and paradigms. The most prominent words are Python, JavaScript, PHP, Perl, C, C++, SQL, XML, Pascal, Visual Basic, Cobol, Assembly, Object-Oriented, Fortran, Prolog, Java, Scripting, Squeak, Lisp, Haskell, Logo, LabVIEW, and MATLAB. Other visible words include JavaScript, PHP, Perl, C, C++, SQL, XML, Pascal, Visual Basic, Cobol, Assembly, Object-Oriented, Fortran, Prolog, Java, Scripting, Squeak, Lisp, Haskell, Logo, LabVIEW, and MATLAB.

Course Requirements

- The course is intended as a master course.
- Solid programming skills in Java/C/C++ are required.
- Assumed that students have introductory skills in Scala, Python or Ruby.
- For all code examples, we will use Go (Golang) as language.

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Goal of the Course



- Learn how Golang differs conceptual from other languages
- Get solid skills to pick the right language for a given problem
- Know the concepts of languages
- Learn how to write professional code with Golang

Lessons

Lesson 1 - Introduction

Why Go? History, Concepts, Comparison to C/C++/Java/Python/Ruby/Scala/JS

Lesson 2 - Basic Language Overview

Control Structures, Functions, Pointers, Tooling, Testing and Errorhandling

Lesson 3 - OOP with Go

Concepts and Differences to other Languages

Lesson 4 - Functional Programming

Arrays and Slices, Maps, Functional Programming

Lesson 5 - Fuctional Parsers

Parser Combinators with Go

Lesson 6 - Parallel Programming - Part I

Go Routines, Channels

Lessons

Lesson 7 - **Parallel Programming** - Part II

Synchronization with Locks

Lesson 8 - **Distributed Programming** - Part I

GRPC

Lesson 9 - **Distributed Programming** - Part II

Blockchain, Encryption, Security

Lesson 10 - **Microservices**

Microservices with Go, RESTful APIs

Lesson 11 - **System Programming**

Reimplementing Docker with Go

Lessons

Lesson 12 - Summary

Picking the appropriate language for a given problem

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Structure of this course

- Recap - 15 min
- Lecture - 30 min
- Online Tutorials (Video) - 45 min
- Student Discussions - 30 min
- Introduction to Exercises - 15 min
- Exercises - 45 min (+ Homework)

Semester Work

15 Minutes presentation + 5 pages document (everything in English)

- Compare PP (Procedural Programming) in Go with:

C
Modula
Ada

- Compare OOP (Object Oriented Programming) in Go with:

Smalltalk
C++
Eiffel
Objective C

- Compare FP (Functional Programming) in Go with:

Haskell
Java8
F#

Semester Work

- Compare Go Concurrency with:

Erlang
Scala Actors
D
Occam

- Compare Go with:

Rust
Swift
JavaScript
Ruby
Kotlin
C++17

Books

Donovan, Kernigham: The Go Programming Language

[34190440/ref=sr_1_1?ie=UTF8&qid=1537786910&sr=8-1&keywords=go+programming+language](https://www.amazon.de/Programming-Language-Addison-Wesley-Professional-Computing/dp/0034190440/ref=sr_1_1?ie=UTF8&qid=1537786910&sr=8-1&keywords=go+programming+language) (https://www.amazon.de/Programming-Language-Addison-Wesley-Professional-Computing/dp/0034190440/ref=sr_1_1?ie=UTF8&qid=1537786910&sr=8-1&keywords=go+programming+language)

Sebesta: Concepts of Programming Languages

www.amazon.de/Concepts-Programming-Languages-Global-Sebesta/dp/1292100559/ref=sr_1_1?ie=UTF8&qid=1537787024&sr=8-1&keywords=sebesta+programming (https://www.amazon.de/Concepts-Programming-Languages-Global-Sebesta/dp/1292100559/ref=sr_1_1?ie=UTF8&qid=1537787024&sr=8-1&keywords=sebesta+programming)

Thank you

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