TECHNISCHE UNIVERSITÄT KAISERSLAUTERN

Module Handbook

TUK MODHB Homapage

Module INF-02-10-M-2

Computer Organization and System Software (M, 8.0 LP)

Module Identification

Module Number	Module Name	CP (Effort)
INF-02-10-M-2	*Computer Organization and System Software*	8.0 CP (240 h)

Basedata

CP, Effort	8.0 CP = 240 h
Position of the semester	1 Sem. in WiSe
Level	[2] Bachelor (Fundamentals)
Language	[DE] German
Module Manager	Schneider, Klaus, Prof. Dr. (PROF | DEPT: INF)
Lecturers	Grimm, Christoph, Prof. Dr. (PROF | DEPT: INF) Schneider, Klaus, Prof. Dr. (PROF | DEPT: INF) Schürmann, Bernd, PD Dr.-Ing. (WMA | DEPT: INF, GS)
Area of study	[INF-PFL] Mandatory Modules
Reference course of study	[INF-82.79-SG] B.Sc. Computer Science
Livecycle-State	[NORM] Active

Courses

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
4V+2U	INF-02-10-K-2	P	U-Schein	PL1	8.0	WiSe

- About **[INF-02-10-K-2]**: Title: "Computer Organization and System Software"; Presence-Time: 84 h; Self-Study: 156 h
- About **[INF-02-10-K-2]**: The study achievement **"[U-Schein] proof of successful participation in the exercise classes (ungraded)"** must be obtained.

- It is a prerequisite for the examination for PL1.

Examination achievement PL1

- Form of examination: **written exam (Klausur) (120-150 Min.)**
- Examination Frequency: each semester
- Examination number: 60210 ("Computer Organization and System Software")

Evaluation of grades

The grade of the module examination is also the module grade.

Contents

From [INF-02-10-K-2] Computer Organization and System Software:

Processor architecture

- Pipelining (principle, conflict detection and avoidance)
- Jump prediction techniques
- Outlook on superscalar architectures and VLIW processors

Computer Architecture

- Processors and memory (main memory, hard disks, optical memory)
- Memory hierarchy: Cache memory and its architecture
- Bus systems
- Graphics cards

Assembler programs

- Runtime behavior: Analysis of Cache Effects
- Program relocation
- Binders and loaders
- Interrupt handling

Compiler backend

- Three address code: Generation from higher programming languages
- Data flow analysis
- Register allocation: graph coloring and linear scan
- Code generation for RISC processors

Operating systems

- Tasks of operating systems
- Program flow: stack, heap and memory management
- Process management: context switch
- Interprocess communication: mutual exclusion, semaphores, spin-locks
- Input/output system
- Main memory management (virtual memory)
- File systems

Competencies / intended learning achievements

Upon successful completion of the module, students will be able to

- explain the architecture of modern processors and computer systems,
- explain the basics of system software such as compilers and operating systems,
- explain the interaction of hardware and software and their influence on the runtime behaviour of programs,

- explain the organization of virtual memory and code generation by compilers.

Literature

From [INF-02-10-K-2] Computer Organization and System Software:

- Skript.
- A.W. Appel: Modern Compiler Implementation in ML, Cambridge University Press, 2008.
- J.D. Ullmann, M.S. Lam, R. Sethi und A.V. Aho: Compiler: Prinzipien, Techniken und Werkzeuge, Pearson, 2008.
- S.P. Dandamudi, Fundamentals of Computer Organization and Design, Springer, 2002.
- P. Herrmann: Rechnerarchitektur: Aufbau, Organisation und Implementierung, Vieweg 2011.
- Walter Oberschelp und Gottfried Vossen: Rechneraufbau und Rechnerstrukturen, Oldenbourg, 2006.
- D.A. Patterson, J.L. Hennessy, Computer Organization Design - The Hardware Software Inferface, Morgan Kaufmann Publishers, 2014.
- A.S. Tanenbaum und T. Austin: Rechnerarchitektur: Von der digitalen Logik zum Parallelrechner, Pearson Studium, 2014.
- A. Tanenbaum, Moderne Betriebssysteme, 4. Aufl., 2016, Pearson.

Requirements for attendance of the module (informal)

None

- Notice: Some Courses have informal requirements for attendance:
  - #A: [INF-02-10-K-2] Computer Organization and System Software (4V+2U, 8.0 LP) (P: Obligatory)

Requirements for attendance of the module (formal)

None

References to Module / Module Number [INF-02-10-M-2]

Course of Study	Section	Choice/Obligation
[INF-82.79-SG] B.Sc. Computer Science	[Compulsory Modules] Computer Science Systems	[P] Compulsory
[WIW-82.176-SG] B.Sc. Business Administration and Engineering specialising in Computer Science	[Fundamentals] Field of study: Computer Science	[WP] Compulsory Elective
[MAT-88.118-SG] M.Sc. Industrial Mathematics	[Core Modules (non specialised)] Computer Science and Computational Methods	[WP] Compulsory Elective
[MAT-88.276-SG] M.Sc. Business Mathematics	[Core Modules (non specialised)] Computer Science and Computational Methods	[WP] Compulsory Elective

Module-Pool	Name
[MV-MBINFO-MPOOL-6]	Wahlpflichtmodule Maschinenbau mit angewandter Informatik