System Software (B-KUL-T34SPE)

5 ECTS | English | 63 | First term | Cannot be taken as part of an examination contract

Desmet Stef (coordinator) | More
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Aims

Learning outcomes

- K1: Basic scientific-disciplinary knowledge and comprehension
- I1: Problem analysis and solving
- I2: Design and / or development
- G1: Information gathering and processing
- G3: Critical thinking
- G5: Professionalism

Explanation

At the end of this course the student is able

- to identify and explain common terminology in the context of C programming, system calls, multi-tasking and inter-task communication [K1].
- to explain and to discuss C code, even including Linux system calls and multitasking code; for example, discuss memory management and draw a memory layout, find and correct compile/run-time errors, discuss the correctness and efficiency of the code , etc. [K1, G3]
- to analyse a problem and to implement a correct solution in C on Linux; the student is also able to critically compare this solution with alternative implementations [I1, I2, G3].
- to work with Linux, more specifically, with the command line interface of Linux [K1].
- to identify and to use the typical C development tools (e.g. gcc, make, Valgrind, …) [K1].
- to find and to apply missing information and code using resources such as API descriptions, Linux man pages, etc. [G1, G5].

Previous knowledge

- Computer systems and databases
- Object-oriented programming
- Software development

Order of Enrolment

Mixed prerequisite:
You may only take this course if you comply with the prerequisites. Prerequisites can be strict or flexible, or can imply simultaneity. A degree level can be also be a prerequisite.
Explanation:
STRICT: You may only take this course if you have passed or applied tolerance for the courses for which this condition is set.
FLEXIBLE: You may only take this course if you have previously taken the courses for which this condition is set.
SIMULTANEOUS: You may only take this course if you also take the courses for which this condition is set (or have taken them previously).
DEGREE: You may only take this course if you have obtained this degree level.

(STRICT(T2OGP0) OR STRICT(T2OGPE) OR STRICT(T2OGDE) OR STRICT(T2OGPD) OR STRICT(T2OOPD)) AND (STRICT(T34SD0) OR STRICT(T34SDE) OR STRICT(T34SDS) OR STRICT(T2SD02) OR STRICT(T2SDE2))

The codes of the course units mentioned above correspond to the following course descriptions:
T2OGP0 : Object-georiënteerd programmeren (No longer offered this academic year)
T2OGPE : Object-Oriented Programming (No longer offered this academic year)
T2OGDE : Object-Oriented Programming and Databases (No longer offered this academic year)
T2OGPD : Object-georiënteerd programmeren en databanken
T2OOPD : Object-Oriented Programming and Databases
T34SD0 : Software Development (No longer offered this academic year)
T34SDE : Software Development (No longer offered this academic year)
T34SDS : Software Development (S) (No longer offered this academic year)
T2SD02 : Software development
T2SDE2 : Software Development

This course unit is a prerequisite for taking the following course units:
T34EE5 : Engineering Experience 5 - Electronics Engineering
T46MP0 : Media Processing
T44UCE : Ubiquitous Computing Systems (No longer offered this academic year)

T44UBC : Ubiquitous Computing Systems (No longer offered this academic year)
T44UBE : Ubiquitous Computing Systems
T44UBQ : Ubiquitous computing systems

Identical courses

This course is identical to the following courses:
T34SP0 : Systeemprogrammatuur

Is included in these courses of study

Bachelor of Engineering Technology (Programme for students started before 2020-2021) (Leuven) (Specialisation: Electronics Engineering) 180 ects. 3
Bachelor of Engineering Technology, 2+2 Module (Programme for students started before 2021-2022) (Leuven) (Specialisation: Electronics Engineering) 180 ects. 3
Preparatory Programme: Master of Electronics and ICT Engineering Technology (Leuven) 90 ects. 1

Activities

3 ects. **System Software: Lectures** (B-KUL-34hSP_E)

3 ECTS English **Format: Lecture** 27 **First term**
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Content

Often, system software and embedded software are written in the programming language C and run on the Linux operating system. Because of the increasing interest in embedded systems, it is very important for students Electronics/ICT to master the programming language C and become familiar with Linux, especially the Linux system call interface. The basic principles of multi-tasking and inter-task communication should also be understood by the students.

- Advanced C programming concepts: pointers, dynamic memory, file I/O, system calls, low-level operations, call-backs, function pointers, command-line calls, macros, ...
- C build process and tools (preprocessor, compiler, linker, profiler, debugger, Valgrind, objdump, nm, ldd, libraries, ...).
- Linux and the Linux system call interface
- Concurrency and multi-tasking (threads, processes, synchronization, inter-task communication)

Course material

- Course slides
- Example code
- Online resource
- Linux man pages

Recommended background reading:

- The C Programming Language, Kernighan, Ritchie(publications.gbdirect.co.uk/c_book)
- The linux Programming Interface: A Linux and UNIX system Programming Handbook, Michael Kerrisk
- Understanding and Using C Pointers, R. Reese
- 21st Century C: C Tips from the New School, B. Klemens
- Learn c the Hard Way, Zed A. Shaw

2 ects. **System Software: Lab Sessions** (B-KUL-34oSP_E)

2 ECTS English **Format: Practical** 36 **First term**
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Content

Programming exercises for Linux:

- Linux and the Linux command-line
- Development tools
- C programming exercises
- Programming exercises on Linux system calls

- Programming exercises on processes and IPC (inter-process communication) an on Posix Threads

Course material

- Lab manual on Toledo.
- Computer lab tools (software and hardware) and manuals.
- Linux man pages.
- On-line resources.

Evaluation

Evaluation: System Software (B-KUL-T70342)

Type : Partial or continuous assessment with (final) exam during the examination period

Description of evaluation : Oral, Written, Take-Home

Type of questions : Open questions

Learning material : None

Explanation

If the university decides that it is confronted with situations of general force majeure or situations where the safety and health of members of the academic community of KU Leuven may be endangered and changes to the teaching and evaluation activities occur as a result, these changes will be communicated via Toledo.

1. Calculation of the final mark

This course contains only one published component mark. Consequently, this component mark is the final mark.

2. Calculation of the published component marks

The only component mark is a whole number between 0 and 20. It is an evaluation of the student's performance based on an individual take-home assignment with oral defense during the examination period. More details on and the deadline for this take-home assignment will be announced on Toledo.

3. Absences

Unauthorized absence during the exam (oral defense of programming assignment) leads to NA as a final mark.

For absences during the teaching weeks, please contact the education ombuds on the first day of your absence. If you missed one or more obligatory sessions, please contact your professor as soon as possible and certainly within a week. For absences within the exam period, please contact the exam ombuds on the first day of your absence.

4. Partial transfers and re-examinations

Component marks of at least 10/20 published in the academic progress file are transferred to the next examination period within the same academic year and to the following academic years, except for temporary marks and marks for intermittent tests.

When needed, additional information on the evaluation activities is provided during the lessons and/or made available on the Toledo pages of the course.

Required in stage	Optional in stage	First term	Second term	Both terms
This year	Next year	Alternating years	External	Prerequisites
Taught by	Language of instruction	Duration		

- Alumni
- International Office
- Student Services
- Pangaea
- LRD
- UZ Leuven
- Jobs and Careers
- Libraries
- News and press
- Agenda
- Culture
- Sports
- KU Leuven shop
- Contact

INTERNAL TOOLS

- Toledo
- KU Loket
- Webmail
- Intranet
- Who's who
- Organisational chart

OTHER LANGUAGES

- Nederlands
- Français
- Deutsch
- Español
- 中文版
- Русский

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