

SYLLABUS

Real-Time System 7.5 credits D0003E

Realtidssystem

Course syllabus admitted: Autumn 2023 Sp 1 - Present

**DECISION DATE
2021-02-16**

Real-Time System 7.5 credits D0003E

Realtidssystem

First cycle, D0003E

Education level	Grade scale	Subject	Subject group (SCB)
First cycle	G U 3 4 5	Datalogi	Computer Technology

Main field of study

Computer Science and Engineering

Entry requirements

In order to meet the general entry requirements for first cycle studies you must have successfully completed upper secondary education and documented skills in English language and courses of at least 60 credits at first cycle including the following knowledge/courses: Knowledge of imperative programming (D0009E Introduction to Programming) and object-oriented programming and design (D0010E Object-oriented Programming and Design). The organization of a micro-computer, assembler programming and interrupt handling (D0013E Microcomputer engineering).

Selection

The selection is based on 1-165 credits.

Course Aim

The student should:

- Demonstrate ability for teamwork and cooperation and demonstrate ability to independently identify the need and ability to gain additional knowledge to enhance their skills.
- Demonstrate knowledge of proven experience in development and design of software for real-time system that is controlled by external events, and demonstrate broad knowledge in the area.
- Show profound knowledge in the design of concurrent software for synchronization and concurrent events.
- Demonstrate the ability to critically, independently and creatively identify, formulate and manage complex problems with hard timing requirements and, based on problem specifications, demonstrate the ability to plan and, using appropriate methods, dimension hardware and, in software, implement systems that solve the problem in the problem specification and demonstrate an ability to critically and systematically integrate knowledge about real-time systems in technical systems.
- Demonstrate the ability to critically evaluate and analyze both specifications and software for real-time system and demonstrate an ability to model, predict and evaluate events in real-time systems, even with limited information about the actual properties of the system with respect to the intensity of external events.
- Show knowledge of mathematical tools, as well as the scientific foundation for scheduling analysis. Also, show understanding of problems associated with process synchronization and timing properties in real-time systems.
- Demonstrate ability for teamwork and cooperation and demonstrate ability to independently identify the need and ability to gain additional knowledge to enhance their skills.

Contents

The C language and bit-level programming. Active vs. reactive handling of input data. Context switches and the organization of a multi-threaded system kernel. The critical section problem, object-oriented encapsulation and synchronization protection. Reactive objects as system building blocks, asynchronous vs. synchronous communication. Time- and interrupt-driven processes, process scheduling. Deadlines and priorities, priority inheritance, simple schedulability analysis. Programming of drivers for external units. A few classic models for process abstraction and synchronization.

Realization

Each course occasion's language and form is stated and appear on the course page on Luleå University of Technology's website.

Instruction consists of lectures, seminars and laboratory work. Lab assignments will be associated with a deadline.

Examination

If there is a decision on special educational support, in accordance with the Guideline Student's rights and obligations at Luleå University of Technology, an adapted or alternative form of examination can be provided. Written exam and both oral and written presentation of laboratory assignments.

Passing the lab assignments part of the course requires a passed grade on all individual assignments.

Unauthorized aids during exams and assessments

If a student, by using unauthorized aids, tries to mislead during an exam or when a study performance is to be assessed, disciplinary measures may be taken. The term "unauthorized aids" refers to aids that the teacher has not previously specified as permissible aids and that may assist in solving the examination task. This means that all aids not specified as permissible are prohibited. The Swedish version has interpretative precedence in the event of a conflict.

Remarks

Credits for this course cannot be combined with credits for SMD006 Reactive Programming and SMD117 Reactive Programming and C.

Overlap

The course D0003E is equal to SMD138

Course offered by

Department of Computer Science, Electrical and Space Engineering

Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0002	Laboratory work	U G#	3	Mandatory	A07	
0003	Written exam	G U 3 4 5	4.5	Mandatory	S22	

Study guidance

Study guidance for the course is to be found in our learning platform Canvas before the course starts. Students applying for single subject courses get more information in the Welcome letter. You will find the learning platform via My LTU.

Last revised

by Jonny Johansson, HUL SRT 2021-02-16

Syllabus established

by the Department of Computer Science and Electrical Engineering 2007-02-28