UNIVERSITY OF GOTHENBURG

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

DIT173 Dependable Real-Time Systems, 7.5 credits

Pålitliga realtidssystem, 7,5 högskolepoäng

Second Cycle

Confirmation

This course syllabus was confirmed by Department of Computer Science and Engineering on 2019-02-07 to be valid from 2020-01-19, spring semester of 2020.

Field of education: Science 100%
Department: Department of Computer Science and Engineering

Position in the educational system

The course is offered within the Master's programme N2COS Computer Science. It is also a single subject course at the University of Gothenburg.

The course can be part of the following programmes: 1) Computer Science, Master's Programme (N2COS), 2) Applied Data Science Master's Programme (N2ADS), 3) Computer Science, Bachelor's Programme (N1COS) and 4) Game Design & Technology Master's Programme (N2GDT)

Main field of studies	*Specialization*
Computer Science	A1F, Second cycle, has second-cycle course/s as entry requirements

Entry requirements

To be eligible for the course students should have successfully completed courses corresponding to 120 higher education credits within the subject Computer Science or equivalent. In addition, a pass grade in the preparatory course DIT162 Real-Time systems, 7.5 credits, is required.

Applicants must prove knowledge of English: English 6/English B or the equivalent level of an internationally recognized test, for example TOEFL, IELTS.

Learning outcomes

On successful completion of the course the student will be able to:

Knowledge and understanding

- demonstrate knowledge about the terminology of scheduling, dependability and complexity theory
- describe the principles and mechanisms used for scheduling of task execution and data communication in real-time systems

Competence and skills

- formulate requirements for computer systems for time and safety critical applications
- design realtime systems and apply techniques to verify whether the realtime requirements are met or not
- derive the theoretical performance limitations of a given real-time system

Judgement and approach

- reason about advantages and disadvantages regarding the choice of the optimal design for a real-time systems given certain conditions

Course content

This course is intended to give a deeper understanding of the problems involved in designing dependable real-time systems based on multiprocessor architectures.

Specifically, the course covers the following topics:

- Background: motivation for; and definition of; real-time computing systems.
- Characteristics of real-time systems: application constraints; design methods; task models; run-time mechanisms; architectures.
- Evaluation of real-time systems: performance measures; evaluation methodologies.
- Single and multiprocessor scheduling: problem definition; terminology; and algorithms.
- Complexity theory and NP-completeness in the context of real-time scheduling.
- Real-time communications: protocols and end-to-end delay guarantees.
- Fault-tolerance techniques for real-time systems: models; algorithms and architectures.

Sub-courses

1. **Homework assignment 1** *(Hemuppgift 1),* 4 credits
   Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)

2. **Homework assignment 2** *(Hemuppgift 2),* 3.5 credits
   Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)

Form of teaching

The course is organized as a series of lectures where fundamental theories and implementation methods are presented, as well as two homework assignments on the specific topics covered during the lectures. Weekly consultation sessions offer assistance regarding questions and problems related to the homework assignments.

Language of instruction: English

Assessment

The course is examined by two homework assignments, one in the beginning of the course and the other at the end of the course.

For the first homework assignments the student shall implement a dependable software for a distributed real-time system, that is examined by means of documentation and demonstration of the software. For the second homework assignment the student shall solve a set of theoretical problems and document the solutions in a written report that is orally examined.

The homework assignments are carried out normally in groups of two students, while the examination and grading of the assignments are individually performed.

If a student, who has failed the same examined component twice, wishes to change examiner before the next examination, a written application shall be sent to the department responsible for the course and shall be granted unless there are special reasons to the contrary (Chapter 6, Section 22 of Higher Education Ordinance).

In cases where a course has been discontinued or has undergone major changes, the student shall normally be guaranteed at least three examination occasions (including the ordinary examination) during a period of at least one year from the last time the course was given.

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).
A Pass grade (G) for the entire course requires at least a Pass grade for all sub-courses.
A Pass with Distinction grade (VG) for the entire course requires a VG grade for all sub-courses.

Course evaluation

The course is evaluated through meeting after the course between teachers and student representatives. Further, an anonymous questionnaire is used to ensure written information. The outcome of the evaluations serves to improve the course by indicating which parts could be added, improved, changed or removed.

Additional information

The course is a joint course together with Chalmers.

Course literature to be announced the latest 8 weeks prior to the start of the course.

The course replaces the course DIT172 Parallel and Distributed Real-Time Systems, 7.5 credits. The course cannot be included in a degree which contains DIT172. Neither can the course be included in a degree which is based on another degree in which the course DIT172 is included.