EQ2871 Cyber-Physical Networking 7.5 credits

Nätverksteknologi för cyberfysiska system

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Course syllabus for EQ2871 valid from Spring 2019

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Electrical Engineering

Specific prerequisites

Basic eligibility to be accepted to the course requires that the applicant has a degree on the first level consisting of at least 180 higher education credits or a corresponding foreign degree. And a good knowledge of English, equivalent to Eng 6.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

In order to pass the course, students should be able to:

- Identify the main challenges associated with cyber-physical networks with respect to the status quo in networking today.

- List the main principles/protocols/algorithms/research activities which address these challenges as of today.

- Describe how these principles/protocols and algorithms solve the challenges at hand.

- Dimension either local or wide-area networks for cyber-physical applications with respect to the principle/protocol chosen.

- Identify limits of principles/protocols and algorithms with respect to cyber-physical applications.

- Analyze a selected application scenario for cyber-physical networking and demonstrate the interrelationship between the different components of the system.

A-level students should in addition be able to:

- Identify the most important research problems in the different areas of cyber-physical networking and current approaches to overcome them.

- Combine different principles/protocols/approaches of different areas/networking layers into a single system conceptually and identify performance bottlenecks.

- Summarize, explain and apply the most important models underlying the major technical solutions developed in the different areas of cyber-physical networking.

Course contents

The course gives an introduction in the area of networks for cyber-physical systems. On the technical side, it discusses the major challenges, principles, solutions and applications of wired and wireless networks that are utilized for the operation of a cyber-physical system. Regarding skills, the course enables the students to work closely with research literature and teaches students to tackle design, dimensioning and optimization problems with respect to the communication networking of cyber-physical systems.

The course introduces the main challenges, principles, solutions and applications of communication networks for cyber-physical systems. As an emerging networking paradigm, cyber-physical networking spans all communication processes that do not involve humans and which are designed to pursue tasks of automation and autonomy in the most general sense. This enables completely new application areas but introduces many novel and severe challenges. These have been addressed by research over the last couple of years and have initiated new standardization activities as well as significant research findings. This course

deals with these new insights, principles and technologies and puts them in relation to applications in factory automation, robotics, traffic automation and other fields. In particular, the course is divided into six different blocks: Introduction to cyber-physical systems and their requirements, cable-based networking for cyber-physical systems, massive wireless networks for cyber-physical systems, critical wireless networking for cyber-physical networking, aspects of higher-layer networking for cyber-physical networking, and application examples. Each block is accompanied by a mandatory assignment for students to be worked on individually as well as in groups. Assignments that have to be worked on in groups are afterwards presented in front of class.

Course literature

Reading assignments (research papers) are passed to the students one week before class.

Examination

- INL1 - Homework, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- TEN1 - Exam, 4.5 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Other requirements for final grade

The course is graded on an A-F basis. Assessment contains two components. Students have to work on the exercise sets and take a final exam. All exercise sets together yield a certain grade (A-F). The final exam is either a written examination or an oral examination. Exams and exercises have a 3:2 weight towards the final grade.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.