HALMSTAD UNIVERSITY
Phone +46 35 16 71 00 - www.hh.se
School of Information Science, Computer and Electrical Engineering

Design of Embedded and Intelligent Systems, 15 credits

Konstruktion av inbyggda och intelligenta system, 15 hp

Second level
Main field: Computer Science and Engineering A1F
Syllabus is adopted by the School of Information Science, Computer and Electrical Engineering (2008-05-29) and is valid for students admitted for the autumn semester 2009.

Placement in the Academic System

The course is included as a compulsory course in the Master Programme in Embedded and Intelligent Systems 120 credits.

Prerequisites and Conditions of Admission

Cooperating Intelligent Systems 7.5 credits, Signal analysis and representation 7.5 credits, Embedded systems programming 7.5 credits and Applied mathematics for computer science and engineering 7.5 credits. In addition to that deep knowledge within some part of the area embedded and intelligent systems.

Course Objectives

The course trains the students' abilities to integrate theoretical and practical knowledge and competence relevant for research, development and engineering of embedded and intelligent systems with focus on techniques for and applications of sensor networks.

The course is included in the main area of the Master Programme in Embedded and Intelligent Systems.

Upon completion of the course the student shall:

- In project form be able to use own specialized knowledge (e.g., on parallel programming, image analysis, embedded systems or communication technology) in cooperation with others with neighboring specialized knowledge, in order to develop network sensor applications.
- Be able to condition and combine signals from several simple sensors using basic signal processing in a microprocessor into a functionally more advanced, or qualitatively better, composed sensor.
- Manage to apply low-level programming in order to handle sensor and communication devices and to set up communication links and dialogs between programs in different processes and processors over embedded networks.
- Be able to describe and state the basics in measurement technology, sensors, signal conditioning, filtering and related electronics.
- Be able to describe and demonstrate how one with use of signal processing algorithms can create more advanced and integrated sensors and how one can aggregate, detect and separate discrepancies from base information by use of distributed network connected sensors and model based analysis.
- Be able to constructively participate in advanced system development work in project form.
- Be able to describe as well as demonstrate skill in requirement analysis, modeling, engineering, integration and optimization to develop system application with typical embedded application constraints.
- Describe opportunities and limitations for the technology and be able to discuss scientific, society and ethic aspects on the technology development and use.
- Identify own limitations and needs to search for more or better knowledge in order to minimize risks and to follow and make use of the rapid development of the technology and its applications.

Primary Contents

The main subjects covered in the course are methods for analysis and design of composed system products controlled and given intelligent functions by use of embedded systems. Other subjects are methods for surveillance and control using networks of sensors and actuators as well as methods for project work.

The main part of the course is a development project, carried out in groups of 4-6 students, complemented with subject and skill related lectures, labs and seminars.

Teaching Formats

The course is based on a large project task supported by a number of lab modules, lectures on important subjects and

some discussion seminars. The project is devoted to the development of a sensor network application and is intended to test and assess the student's skills in using their specialization knowledge in cooperative work with other students.
The course is based on the use of lab equipment and tools of the following kind:

- Software development environment and hardware platform for low level micro processor programs and sensor network experiments.
- Camera or image sensor with associated support framework for reading and processing of captured image and image sequence files.

Teaching is in English.

Examination

The overall grades of Fail, 3, 4 or 5 will be awarded for the course.
The project work is examined by a written report complemented with an oral presentation and demonstration of the results of the group. The whole course content is examined in an individual oral exam. The project work corresponds to 7.5 credits. The oral exam gives 7.5 credits. The total grade is based equally on both these two parts.

Course Evaluation

Course evaluation is part of the course. This evaluation should offer guidance in the future development and planning of the course. Course evaluations should be documented and made available to the students.

Course Literature

Laboratory manuals provided by the teacher and reading instructions to scientific papers relevant to each project subject area.