MF2042 Embedded Systems for Mechatronics, I 6.0 credits

Inbyggda system för Mekatronik, I

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

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

Establishment

Course syllabus for MF2042 valid from Autumn 2010

Grading scale

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

Education cycle

Second cycle

Main field of study

Mechanical Engineering

Specific prerequisites

CMAST4, CDEPR4, CFATE4: SG1130/SG1131, SG1140, MF1016, EL1120/EL1000, DD1321/(DD1322+DD1324) or similar

CDATE, TIPUM, TIPDM, CDATE, TAEEM with First level course(s) in mechanics, electrical engineering, automatic control and programming

Language of instruction

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

Intended learning outcomes

The overall aim of the course is to provide an understanding of the design and implementation of embedded systems in the context of mechatronic products, with emphasis on basic technologies and elements of design.

This understanding means that You after the course should be able to

1. Provide examples of existing embedded systems based products and describe the special requirements placed in developing such systems.

2. Describe and explain important steps in the design of such systems, including useful abstractions and views, and be able to give examples of dependencies between system functionality and the implementation, common faults and failures of embedded systems, and trade-offs that the designer has to deal with.

3. Be able to use modern integrated development environments for microcontroller/processor programming and their features for testing and debugging.

4. Describe and be able to explain the basic operation of microcontrollers/microprocessors, their internal features and peripherals, and how C-language and assembly instructions correspond to basic processor operations. Describe and provide criteria for choosing microcontrollers and/or FPGA based solutions.

5. Be able to develop basic microcontroller programs for mechatronic applications, including the usage of I/O and communication peripherals.

6. Describe, explain and apply basic concepts of concurrent and real-time programming including fundamental execution strategies (e.g. foreground-background programming) and scheduling theory, other structuring concepts for embedded software, and their vizualisation using selected diagramming techniques.

7. Describe, explain and apply some of the basic concepts of communication protocols, in particular with reference to the Controller Area Network (CAN).

Course contents

The course includes

- Lectures to provide overview and inspiration.

- Tutorials – where new tools and techniques are introduced through detailed instructions.

- Laboratory exercises where new tools and techniques are introduced and in which the participants work on a set of exercises.

• Classroom exercises where more details are provided compared to the lectures, and where the participants can practice theoretical parts of the course.

• A smaller project, where the course participants work in groups with the specification, design and implementation of an embedded system.

Each week of the course focuses on a specific theme. The exercises are modularized according to these themes.

Disposition

The course is based on experiences from several predecessor courses including Microprocessors in products, Motion control and Real-time implementation and Embedded control systems.

Course literature

One or more suitable course books will be provided.

All course material (lectures, exercises, tutorials, manuals etc.) which are distributed during the course will be available on the course web (as far as copyrighting allows).

Examination

- KON1 - Written Test, 1.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Work, 3.0 credits, grading scale: P, F
- TEN1 - Written Exam, 2.0 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.

(a) Approved laboratory exercises.
(b) Approved exam.
(c) Approved project.

The grading is based on a weighted score of (a) through (c).

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.