Software Design for Industry Automation 7.5 credits D7033E

Mjukvarudesign för industriell automation

Course syllabus admitted: Autumn 2023 Sp 1 - Present

DECISION DATE
2023-02-15

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Software Design for Industry Automation 7.5 credits
D7033E

Mjukvarudesign för industriell automation

Second cycle, D7033E

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

Entry requirements

Before enrolling in this course, students should have basic understanding of:
Knowledge in programming corresponding to D0009E (Introduction to programming) 7.5 credit or D0017E (Programming för engineers) 7.5 credit.

Good knowledge in English equivalent to English 6.

Selection

The selection is based on 30-285 credits

Course Aim

This course covers advanced topics in software development for applications in Industry 4.0 using component-based design methodology and systematic model-driven design of automation systems. This course focuses on the design of complex industrial automation software which are portable, configurable and interoperable.

After the completion of this course, students will be able to:

1. Understand the modern challenges for industrial software systems design
2. Apply systematic design for the engineering of industrial automation systems with the waterfall systems engineering method
3. Design automation systems which are portable, configurable and interoperable with the modern component-based architectures and tools.
4. Understand and apply the basic concept of component-based software design in industrial automation.
5. Understand and apply the use of digital twins for virtual commissioning of industrial software.
6. Solving automation problems with real life examples

At the end of the course, students will be able to:

1. Apply Systems Engineering approach to the engineering of industrial automation systems from requirements to implementation to testing.
2. Design distributed industrial automation systems which are portable, configurable and interoperable
3. Problem solving and self-learning

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Contents

The topics covered by lectures are:

1. Introduction to Distributed Automation Systems
2. Systems engineering approach to designing industrial automation systems
3. Software design of distributed automatoin systems
    1. Design artefacts of IEC 61499 distributed reference design
    2. State-machine design
    3. State-based controller design
    4. Implementation of automata in PLC
    5. Modularity and reuse
4. Distributed automation design patterns
    1. Design patterns and refactoring
    2. Intelligent Mechatronic Component (IMC) architecture
    3. Service Oriented Architecture (SOA) design
5. Topics of the tutorial and laboratory work are as follows:
    1. Design of distributed control software and human-machine interface using IEC 61499 Function Blocks
    2. Design of IEC 61499 Function Blocks using Service Oriented Architecture

Realization

Each course occasion´s language and form is stated and appear on the course page on Luleå University of Technology's website.
The course activities include lectures, tutorial, laboratory work, and project.

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.
The course follows a practical-work based examination. There are two forms of assessment.

1. The first one will be assignment tasks that will be marked based on the submission to the task problem statement on the course LMS, and there will be will five (5) such tasks.
2. The second will be a single project work that includes a project demo to the whole class. The project will be marked based on this demo of the project along with the report and source code submission to the project problem statement on the course LMS.

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.

Course offered by

Department of Computer Science, Electrical and Space Engineering

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Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0006	Assignment tasks	G U 3 4 5	4	Mandatory	A20	
0007	Project work	G U 3 4 5	3.5	Mandatory	A20	

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 Robert Brännström 2023-02-15

Syllabus established

by Jonny Johansson, HUL SRT 2014-02-14

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