SYLLABUS

Formal Methods for Industrial Software Systems 7.5 credits D7063E

Formella metoder för industriella mjukvarusystem

Course syllabus admitted: Autumn 2023 Sp 1 - Present

DECISION DATE
2023-02-15

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LULEÅ TEKNISKA UNIVERSITET

Formal Methods for Industrial Software Systems 7.5 credits D7063E

Formella metoder för industriella mjukvarusystem

Second cycle, D7063E

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

Entry requirements

Knowledge in Booean algebra corresponding to M0009M - Discrete Mathematics 7.5 hp, Knowledge in programming corresponding to D0009E - Introduction to programming 7.5 hp or D0017E - Introduction to programming for engineers 7.5 hp. The course D0012E - Algorithms and Data Structures 7.5 hp.

Good knowledge in English equivalent to English 6.

Selection

The selection is based on 30-285 credits

Course Aim

- Demonstrate the ability to perform model-based design and verification of industrial software systems in factory automation, industrial measurement and control systems in the Industry 4.0.
- Apply formal methods for verification of functional and non-functional properties of distributed industrial control systems.
- Demonstrate insight into current research and development work in the field distributed industrial software systems, as well as the ability to orally present this knowledge.
- Demonstrate the ability to understand and work with existing source code and conduct peer-reviews.

Contents

- Formal methods in software systems.
- Formal modelling of cyber-physical systems using hybrid and discrete-state formalisms.
- Formalisation of requirements using temporal logic.
- Learning the foundations of model-checkers and solvers.
- Model checking of such systems to prove formally their functional and non-functional properties, such as absence of deadlocks and safety.

Realization

Each course occasion´s language and form is stated and appear on the course page on Luleå University of Technology's website.
Teaching and learning activities consists of lectures and laboratory work. Laboratory work consists of solving simple exercises that give students hands on knowledge of the course topics. The laboratory work is instructor guided (and/or media aided, such as instructional videos or tutorial documents). Lab assignments are reported by demonstration and may be associated with a deadline. Some laboratory work may take the form of homework assignments. Teaching consists of 2 or 3 lectures/seminar per week. These can be in the form of instructor lead or in few occasions, pre-recorded videos.

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. There will be two parts in the course examination: Assignments, and a project work.

Assignment work consists of quizzes and practical project work that deals with problem solving. This consists of submitting source code and a report. Peer review maybe involved to review other students work.

Project work consists of a larger practical project work that deals with problem solving, program analysis (model checking). This consists of submitting source code and a written report and/or oral presentation. Peer review maybe involved to review other students work.

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

Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0001	Assignments	G U 3 4 5	5	Mandatory	A22	
0002	Project work	G U 3 4 5	2.5	Mandatory	A22	

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 2022-02-14