DD2452 Formal Methods 7.5 credits

Formella metoder

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 DD2452 valid from Autumn 2018

Grading scale

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

Education cycle

Second cycle

Main field of study

Specific prerequisites

A course in Discrete Mathematics, e.g. SF1630.

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 a working familiarity with the main methods and tools in the formal methods area, in theory as well as in practice.

After passing the course, the students should be able to:

1. Independently select a suitable modeling approach for some given simple problem;

2. Argue informally and formally for the soundness and limitations of the chosen approach;

3. Identify, specify and verify important system properties using suitable automated or semi-automated tools;

4. Correctly interpret and evaluate the results of the analysis.

For passing the course, a student has to demonstrate the ability to apply the methods discussed in the course; for the highest grade he/she has also to be proficient in the theoretical foundations of these methods.

Course contents

Part I. Hoare Logic and Deductive Verification

1. Code Annotation: The Java Modelling Language
2. Automated Static Assertion Checking: Weakest Preconditions
3. The Correctness-by-Construction Approach to Programming
4. Ghost State and Control-flow Abstraction
5. Model State and Data Abstraction
6. The Back-end: Automated Theorem Proving

Part II. Temporal Logic and Model Checking

7. Kripke Structures and System Modelling
8. Temporal Logic and Model Checking: LTL and CTL
9. Software Model Checking

Disposition

- 7 two-hour lectures
- 7 two-hour tutorial sessions
- 6 homework assignments, peer reviewed at the tutorial sessions
- 2 laboratory assignments
- 1 final five-hour written exam

Course literature

Lecture notes.

Examination

- HEMA - Exercises, 2.5 credits, grading scale: P, F
- LABA - Laboratory work, 2.5 credits, grading scale: A, B, C, D, E, FX, F
- TENA - Examination, 2.5 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.

Other requirements for final grade

One needs to pass the homework assignments, the laboratory assignments, and the final exam.

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.