UNIVERSITY OF GOTHENBURG

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

DIT201 Logic in Computer Science, 7.5 credits

Logic in Computer Science, 7,5 högskolepoäng

Second Cycle

Confirmation

This course syllabus was confirmed by The IT Faculty Board on 2006-11-17 and was last revised on 2018-03-26 by Department of Computer Science and Engineering to be valid from 2018-08-20, autumn semester of 2018.

Field of education: Science 100%
Department: Department of Computer Science and Engineering

Position in the educational system

The course is a part of the Computer Science Master's programme and an elective course at the University of Gothenburg.

The course can be part of the following programmes: 1) Mathematical Sciences, Master's Programme (N2MAT), 2) Computer Science, Master's Programme (N2COS), 3) Computer Science, Bachelor's Programme (N1COS) and 4) Bachelor's Programme in Mathematics (N1MAT)

Main field of studies	*Specialization*
Computer Science-Algorithms and Logic	A1N, Second cycle, has only first-cycle course/s as entry requirements
Computer Science-Secure and Depend Compr Systems	A1N, Second cycle, has only first-cycle course/s as entry requirements

Entry requirements

To be eligible for the course, students should have successfully completed courses corresponding to 60 hec within the subject Computer Science or Mathematics, including 7.5 hec in discrete mathematics (for example DIT980 Discrete Mathematics for Computer Scientists or the sub-course Introductory Algebra of MMG200 Mathematics

1).

Applicants must prove knowledge of English: English 6/English B or the equivalent level of an internationally recognized test, for example TOEFL, IELTS.

Learning outcomes

After completing the course the student is expected to be able to:

Knowledge and understanding

• explain when a given formula is a tautology
• explain the notion of model of a first-order language and the meaning of the completeness and soundness theorems
• explain the notion of model for temporal logic, when a temporal formula is semantically valid and how to check if a branching-time temporal logic formula is valid in a given model
• describe the content of the soundness and completeness theorems for propositional and predicate calculus

Competence and skills

• write and check proofs in natural deduction for propositional and predicate calculus
• specify properties of a reactive system using linear-time temporal logic and branching-time temporal logic

Judgement and approach

• judge the relevance of logical reasoning in computer science, i.e. for modelling computer systems
• analyse the applicability of logical tools to solve problems in computer science, i.e. finding bugs with the use of model checking

Course content

In recent years, powerful tools for verifying software and hardware systems have been developed. These tools rely in a crucial way in logical techniques. Propositional and predicate logic are presented in detail, as well as some specialized logics (temporal logics) used for reasoning about the correctness of computer systems. A sound basic knowledge in logic is a welcome prerequisite for courses in program verification, formal methods and artificial intelligence.

The course presents: propositional logic, predicate logic and model-chaching.
In other words, a thorough introduction to fundamental notions of logic: natural deduction, semantics of both propositional and predicate logic, soundness and

completeness, conjunctive normal forms, Horn clauses, undecidability of predicate logic, expressiveness of predicate logic, existential and universal second-order logic plus an introduction to model checking: Linear-time temporal logic (LTL) and Branching-time temporal logic (CTL).

Form of teaching

The course consists of a series of lectures and exercise sessions.

Language of instruction: English

Assessment

The course is examined by an individual written exam at the end of the course. The exam is given in an examination hall.

There will be non-obligatory individual assignments which grant bonus points for the written exam. These bonus points are valid for the whole academic year.

If a student, who has failed the same examined component twice, wishes to change examiner before the next examination, a written application shall be sent to the department responsible for the course and shall be granted unless there are special reasons to the contrary (Chapter 6, Section 22 of Higher Education Ordinance).

In cases where a course has been discontinued or has undergone major changes, the student shall normally be guaranteed at least three examination occasions (including the ordinary examination) during a period of at least one year from the last time the course was given.

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

Course evaluation

The course is evaluated through meetings both during and after the course between teachers and student representatives. Further, an anonymous questionnaire is used to ensure written information. As far as possible, evaluations are to be completed electronically. The outcome of the evaluations serves to improve the course by indicating which parts could be added, improved, changed or removed. The results of and possible changes to the course will be shared with students who participated in the evaluation and students who are starting the course.

Additional information

The course is a joint course together with Chalmers.