DIT982   Domain Specific Languages of Mathematics, 7.5 higher education credits

Matematikens domänspecifika språk, 7,5 högskolepoäng

First Cycle

Confirmation

This course syllabus was confirmed, was confirmed by Department of Computer Science and Engineering on 2014-12-16 to be valid from 2016-01-18, spring semester of 2016.

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

Position in the educational system

The course is offered within the framwork of several degree programmes. The course is also a single subject course at the University of Gothenburg.

Main field of studies	*Specialization*
Computer Science	G2F, First Cycle, has at least 60 credits in first-cycle course/s as entry requirements

Entry requirements

The student should have successfully completed

- a course in discrete mathematics as for example MMGD10 Introductory Discrete Mathematics.

- 15 hec in mathematics, for example MMGD20 Linear Algebra D and MMGD30 Calculus D

- 15 hec in computer science, for example DIT440 Introduction to Programming or MVG300 Programming with Matlab and DIT011 Object-oriented Software Development

Additional 22.5 hec of any mathematics or computer science courses.

Learning outcomes

On successful completion of the course the student will be able to:

Knowledge and understanding
- design and implement a DSL (Domain Specific Language) for a new domain
- organize areas of mathematics in DSL terms
- explain main concepts of elementary real and complex analysis, algebra, and linear algebra

Skills and abilities
- develop adequate notation for mathematical concepts
- perform calculational proofs
- use power series for solving differential equations
- use Laplace transforms for solving differential equations

Judgement and approach
- discuss and compare different software implementations of mathematical concepts

Course content

The course will present classical mathematical topics from a computing science perspective: giving specifications of the concepts introduced, paying attention to syntax and types, and ultimately constructing DSLs of some mathematical areas mentioned below.

The lecture topics are:
- Introduction to functional programming and calculational proofs
- Introduction to Domain Specific Languages (DSLs): case study linear algebra

- DSLs and mathematics: case study category theory

- Real analysis: mean value theorems, Taylor formulas

- Real analysis: a DSL for power series

- More linear algebra: eigenvalues and optimization

Sub-courses

1. **Written exam** *(Tentamen),* 4 higher education credits

2. **Written Assignments** *(Inlämningsuppgifter),* 3.5 higher education credits

Form of teaching
The main forms of instruction are lectures, seminars, case studies and group work

Language of instruction: English

Assessment
The course is examined by an individual written exam which is carried out in an examination hall at the end of the course and by written assignments carried out in groups of normally 3-4 students.

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).
In order to be awarded the grade G for the whole course the student needs to get at least grade G on both the sub-courses. Students who get the grade VG on both the sub-courses will be awarded the grade VG on the whole course.

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. 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 toghether with Chalmers.