



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

DIT982 Domain Specific Languages of Mathematics, 7.5 credits

Matematikens domänspecifika språk, 7,5 högskolepoäng

First Cycle

Confirmation

This course syllabus was confirmed by Department of Computer Science and Engineering on 2014-12-16 and was last revised on 2018-03-26 to be valid from 2019-01-21, spring semester of 2019.

Field of education: Science 100%

Department: Department of Computer Science and Engineering

Position in the educational system

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

The course can be part of the following programmes: 1) Computer Science, Master's Programme (N2COS), 2) Mathematical Sciences, Master's Programme (N2MAT), 3) Applied Data Science Master's Programme (N2ADS), 4) Bachelor's Programme in Mathematics (N1MAT) and 5) Computer Science, Bachelor's Programme (N1COS)

Main field of studies

Computer Science

Specialization

G2F, First Cycle, has at least 60 credits in first-cycle course/s as entry requirements

Entry requirements

The student should have successfully completed:

- 7.5 hec in discrete mathematics, for example DIT980 Introductory Discrete Mathematics for Computer Scientists
- 15 hec in mathematics, for example MMGD20 Linear Algebra D and MMGD30 Calculus D
- 15 hec in computer science, for example DIT440 Introduction to Functional Programming or MVG300 Programming with Matlab and DIT012

Imperative Programming with Basic Object-orientation

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

Competence and skills

- 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
Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)
2. **Written Assignments** (*Inlämningsuppgifter*), 3.5 higher education credits
Grading scale: Pass (G) and Fail (U)

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 Pass for the whole course the student needs to get the grade Pass on both the sub-courses.

To be awarded the grade Pass with Distinction for the whole course the student needs to get the grade Pass with Distinction on the sub-course written exam and the grade Pass on the sub-course written assignments.

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 together with Chalmers.

Course literature to be announced the latest 8 weeks prior to the start of the course.