UNIVERSITY OF GOTHENBURG

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

DIT025 Applied mathematical thinking, 7.5 credits

Tillämpat matematiskt tänkande, 7,5 högskolepoäng

First Cycle

Confirmation

This course syllabus was confirmed by Department of Computer Science and Engineering on 2018-02-02 and was last revised on 2020-01-21 to be valid from 2020-08-31, autumn semester of 2020.

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

Position in the educational system

The course is a single subject course at the University of Gothenburg.

Main field of studies	*Specialization*
Computer Science	G1N, First cycle, has only upper-secondary level entry requirements
Data Science	G1N, First cycle, has only upper-secondary level entry requirements

Entry requirements

General entrance requirements for university studies and the Swedish course Mathematics C or equivalent.

Learning outcomes

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

Knowledge and understanding

- Explain different aspects of mathematical thinking: mathematical reasoning, problem solving, modelling.

- Explain how mathematical thinking can be applied in different areas.
- Explain common mathematical knowledge and how it can be used (including functions, equations, derivatives and integrals, probabilities, sets, graphs).

Competence and skills

- Show a basic ability to use mathematical concepts such as definitions, theorems, as well as different kinds of mathematical reasoning and proofs (mathematical reasoning).
- Show a basic ability to solve complex and unknown problems with a structured and investigative approach (mathematical problem solving).
- Show a basic ability to investigate real problems, determine if they can be seen from a mathematical perspective and translate to mathematical problems, and adapt mathematical conclusions to the real problem (mathematical modelling).
- Communicate about and with the help of mathematics.
- Use different computational tools as a natural part of thinking and working mathematically.

Judgement and approach

- Identify how own thinking can be used to solve a problem, and to what extent previous knowledge can be used.
- Show a reflective attitude to the course contents and to their own thinking.
- Show care for precision and quality in all work.

Course content

The course is mainly intended to strengthen the students' mathematical thinking, and their ability to apply such thinking in applications, and in their continued studies. The focus is not on mathematical knowledge in the traditional sense, but on the often implied abilities needed to effectively be able to apply the mathematics you already know, and efficiently be able to learn new mathematics. The most important parts are mathematical reasoning, problem solving and modelling. Important aspects such as using the computer as a part of your mathematical thinking, and to be able to communicate with and about mathematics are also integrated in the course. The course therefore includes occasional running and understanding of simple given computer programs.

The course also in a natural way introduces basic mathematical knowledge useful in computer science and other areas, including a selection of Swedish upper secondary courses Mathematics 4 and 5.

By developing the ability to think mathematically, the course complements other more traditional courses in mathematics, and by providing the student with experience of different areas of application, the gap between mathematical theory and relevant

applications is bridged.

The core of the course is a number of carefully selected problems, used as starting points for the student's own learning, where student by working in an investigative way develop their own abilities. We also have lectures which provide a broader understanding, follow-up and perspective. The problems illustrate many different areas of application, and their level of difficulty is adapted to efficiently practice the abilities to think and work mathematically in different situations.

In connection with the exercises, we also discuss different problem solving strategies, reflect on solutions, and compare different ways to solve the same problem. We also give an orientation about the role of mathematics in various applications and demonstrate the importance of mathematical computer models.

Form of teaching

The course is mainly organized in modules. For every module there is an introductory lecture and a compulsory follow-up lecture providing feedback on the problems of the module.

The learning is supported by an interactive way of teaching with a lot of contact between students and teachers. This occurs during supervision hours where students work with the problems and regularly discuss with the supervisors. They will then receive individual feedback and guidance in their own problem solving, and develop their independent abilities.

Language of instruction: English

Assessment

The course is examined through written assignments and with a final report, where the students are encouraged to summarize and reflect over the course in a personal way. The assignments and the final report are normally written in groups of two persons. In addition, each group reads reports from other groups, and discusses them in a final seminar.

To pass the final report, the student needs to show a basic understanding of the course contents, and the presentation and the content of the report must be correct and possible to understand. To get the grade Pass with distinction (VG) on the report, the student must show a deeper understanding of the subject, describing own insights and showing particular attention to quality.
To pass the assignments the reasoning must be correct, and fulfil basic measures of quality. To get the grade Pass with distinction (VG) on the assignments, the student must show a deeper understanding of the subject, describing own insights and showing particular attention to quality.

As a part of the basis for the grading process, the students will declare in writing their respective contributions to the assignments within their group.

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).
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To pass the course, the assignments and the final report must pass. To pass the course, attendance of selected lectures is also required.

To get a higher grade than Pass, a higher weighted average from the grades of the assignments and the final report is required.

Course evaluation

The course is evaluated through meeting 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.

Additional information

The course is a joint course together with Chalmers.

As the exercises are the most important in the course, there is no course literature in the traditional sense. For handouts and further reading, see the course's website.

The course cannot be included in a degree which contains DIT991, DIT992 or DIT856. Neither can the course be included in a degree which is based on another degree in which the course DIT991, DIT992 or DIT856 is included.