Syllabus

for course at advanced level

Theory for computation and formal languages
Teori för beräkningar och formella språk

7.5 Higher Education Credits
7.5 ECTS credits

Course code:	MM7023
Valid from:	Spring 2017
Date of approval:	2016-05-16
Department	Department of Mathematics (incl. Math. Statistics)

Main field:	Mathematics/Applied Mathematics
Specialisation:	A1N - Second cycle, has only first-cycle course/s as entry requirements

Decision

This syllabus was approved by the Board of the Faculty of Science at Stockholm University on 16 May 2016.

Prerequisites and special admittance requirements

Admission to the course requires knowledge equivalent to 60 credits in mathematics or theoretic philosophy, including the courses Mathematics II - Algebra and Combinatorics (MM5013) and Mathematics II - Linear Algebra (MM5012), or equivalent.

Course structure

Examination code	Name	Higher Education Credits
HELA	Theory for computation and formal languages	7.5

Course content

The course covers fundamental aspects of computation, formal languages and rewriting systems.
Models of computation: Turing machines, register machines. Total and partial recursive functions. Gödel's encoding. Universal machines and the halting problem. Rice's theorem. Decidable and undecidable problems in algebra and number theory. Computable real numbers. Gödel's incompleteness theorem.
Formal languages: Strings, regular and context-free languages, finite-state machine.
Rewriting systems for strings and terms. Post–Turing machines, confluence, Knuth–Bendix completion. Unification. Decidable and undecidable problems about equations.

Learning outcomes

It is expected that the student after taking the course will be able to:
* Define fundamental concepts within the theory of computation, formal languages and rewriting systems, and derive their most elementary properties.
* Describe and prove theorems about (un)decidability and apply these to problems within mathematics.

Education

Instruction consists lectures, exercises, and computer projects.

Forms of examination

a. The course is examined as follows: Knowledge assessment takes the form of written examination.

b. Grades are assigned according to a seven-point goal-related grading scale:

A = Excellent
B = Very good
C = Good
D = Satisfactory
E = Sufficient
Fx = Fail (more work required before credit can be awarded)
F = Total fail

c. The grading criteria will be distributed at the beginning of the course.

d. To be awarded a pass, the minimum grade E is required.

e. Students who fail an ordinary examination are entitled to sit additional examinations as long as the course is offered. There is no restriction on the number of examinations. Examinations also include other obligatory elements of the course. Students who have passed an examination may not resit it in order to achieve a higher grade. Students who have failed on two occasions are entitled to request the appointment of a different examiner for the next examination. Any such request must be made to the departmental board. The course has at least two examinations for each academic year in the years in which instruction is provided. Intervening years include at least one examination.

f. Students awarded the grade Fx are given the opportunity to improve their grade to E. The examiner decides the supplementary assignments to be performed and the pass mark criteria. The supplementary assignments will take place before the next examination session.

Interim

Students may request that the examination be conducted in accordance with this course plan even after it has ceased to be valid. However, this may not take place more than three times over a two year period after course instruction has ended. Requests must be made to the departmental board. The provision also applies in the case of revisions to the course plan.

Limitations

The course may not be included in a degree together with the course Computability and constructive mathematics (MM8026) or equivalent.

Misc

The course can be taken as a component of the Master's programme in Mathematics, but it can also be taken as an individual course.

Required reading

Course literature is decided by the departmental board and published on the departments website (www.math.su.se) at least 2 months prior to the course.