

Syllabus

for course at first level

Mathematics I
Matematik I

**30.0 Higher Education
Credits**
30.0 ECTS credits

Course code:	MM2001
Valid from:	Autumn 2014
Date of approval:	2008-09-01
Changed:	2014-05-19
Department	Department of Mathematics (incl. Math. Statistics)
Main field:	Mathematics/Applied Mathematics
Specialisation:	G1N - First cycle, has only upper-secondary level entry requirements

Decision

This syllabus has been approved by the Board of the Faculty of Science at Stockholm University on 8 June 2006, and revised on 7 June 2007, 1 September 2008, 16 May 2011 and 19 May 2014.

Prerequisites and special admittance requirements

Swedish upper secondary school course Mathematics D, or equivalent.

Course structure

Examination code	Name	Higher Education Credits
M101	Basic computational skills	1.5
M102	Polynomials	1.5
M104	Problem solving in algebra	7.5
M103	Matrices and systems of linear equations	1.5
M105	Elementary functions	1.5
M106	Derivation	1.5
M107	Integration	1.5
M108	Problem solving in mathematical analysis	7.5
M109	Seminar in problem solving	3
M110	Computer-aided problem solving	3
M115	Seminar in Problem Solving in Algebra	1.5
M116	Seminar in Problem Solving in Analysis	1.5
M117	Computer-aided Problem Solving in Algebra	1.5
M118	Computer-aided Problem Solving in Analysis	1.5
M119	Problem solving for natural sciences I	6
M120	Problem solving for natural sciences II	9

Course content

a. The course covers

Algebra: Polynomial division, the factor theorem, factorizations, inequalities, absolute value, arithmetic and geometric sum, partial fraction decomposition, complex numbers, elementary combinatorics, prime number factorization, the binomial theorem, mathematical induction, analytical geometry, introduction to logic and sets.

Systems of linear equations, matrices, determinants, vectors in 2 and 3 dimensions, linear independence,

scalar product, straight lines and planes, linear transformations.

Analysis: Functions, power functions, exponential and logarithmic functions, geometry (congruence, similarity), trigonometry, trigonometric functions, inverse functions, inverse trigonometric functions, limits, continuity, derivative, differentiation rules, differentiation of elementary functions, maximum and minimum problems, curve sketching, asymptotes, inequalities, integrals, connection between primitive functions and integrals, variable substitution, partial integration, integrals of certain classes of functions, applications of integrals, differential equations, Taylor's theorem.

Introduction to calculus in several variables: partial derivatives, maximum and minimum problems over compact domains, double integrals.

The contents of the course can be used in modelling in a number of fields, as for example physics and economy.

b. The course includes the following elements:

- M101 - Basic Computational Skills 1.5 credits
- M102 - Polynomials 1.5 credits
- M103 - Matrices and Systems of Linear Equations 1.5 credits
- M104 - Problem Solving in Algebra 7.5 credits
- M105 - Elementary Functions 1.5 credits
- M106 - Derivation 1.5 credits
- M107 - Integration 1.5 credits
- M108 - Problem Solving in Mathematical Analysis 7.5 credits
- M109 - Seminar in Problem Solving 3 credits
- M110 - Computer-aided Problem Solving 3 credits

For students that take the course with study pace 50%, M109 and M110 are replaced by following elements:

- M115 - Seminar in Problem Solving in Algebra 1.5 credits
- M116 - Seminar in Problem Solving in Analysis 1.5 credits
- MM17 - Computer-aided Problem Solving in Algebra 1.5 credits
- MM18 - Computer-aided Problem Solving in Analysis 1.5 credits

Students on certain bachelor's programmes may replace MM104 and MM108 with the following elements:

- M119 - Problem solving for natural sciences I 6 hp
- M120 - Problem solving for natural sciences II 9 hp

Learning outcomes

It is expected that the student after taking the course will be able to:

- * with great facility handle concepts and expressions in elementary algebra and function theory,
- * define the basic concepts in mathematical analysis in one variable and deduce their elementary properties,
- * use methods in mathematical analysis to solve mathematical and applied problems,
- * define the basic concepts in linear algebra in two and three dimensions and deduce their most elementary properties,
- * use methods in linear algebra to solve mathematical and applied problems,
- * solve simple problems in mathematical analysis in several variables,
- * use mathematical software to solve problems in mathematical analysis and linear algebra,
- * account for the solution of simple problems in algebra and analysis, in a logically coherent way, both orally and in writing.

Education

The education consists of lectures, seminars, exercises and laboratory work.

Participation in seminars and computer labs is compulsory. An examiner may, after consultation with the relevant teacher, rule that a student is not obliged to participate in certain compulsory education if there are special grounds for this.

Forms of examination

Examination for the course is arranged in the following manner:

- M104, M108, M119 and M120: written examination
- M109, M115 and M116: submitted work and oral presentations
- M110, M117 and M118: submitted work.

M101, M102, M103, M105, M106 and M107: written examinations online (so called "e-tentor", or "e-exams").

b. Grading is carried out according to a 7-point scale related to learning objectives:

A = Excellent
B = Very Good
C = Good
D = Satisfactory
E = Sufficient
Fx = Fail
F = Fail

Elements M101, M102, M103, M105, M106, M107, M109, M110, M115, M116, M117 and M118 are graded out according to a 2-point scale: pass (G) or fail (U).

c. Grading criteria for the course will be distributed at the start of the course.

d. To pass the course, following criteria must be fulfilled:

- * a minimum grade of E on M104 and M108 (alternatively M119 and MM120)
- * a pass grade on the elements M101, M102, M103, M105, M106, M107, M109 (or M115 and M116) and M110 (or M117 and M118).
- * participation in all compulsory education.

e. Students who fail an ordinary examination are entitled to take additional examinations as long as the course is offered. There is no restriction on the number of examinations. The term "examination" here is used to denote even other compulsory elements of the course. Students who have achieved a pass grade on an examination may not retake this examination in order to attempt to achieve a higher grade. Students who have failed to reach a pass grade on two occasions have the right to request that a different teacher be appointed to set the grade of the course. A request for such appointment must be sent 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. A student who receives the grade Fx will be given an opportunity to upgrade to E by successfully completing some extra task(s) assigned by the examiner, who also decides on the criteria to be fulfilled in order to pass. The completion must take place before the following examination session.

Interim

Students may request that the examination is carried out in accordance with this syllabus even after it has ceased to apply. This right is limited, however, to a maximum of three occasions during a two-year-period after the end of giving the course. A request for such examination must be sent to the departmental board. The provision also applies in the case of revisions to the syllabus.

Limitations

The course may not be included in a degree together with the courses Mathematics, basic course (MA1030), Mathematics, basic course (MA1120), Mathematics for the natural sciences (MA1080), Mathematics for the social sciences (MA1110), or equivalent.

Misc

The course is a component of the Bachelor's Programmes in Mathematics, Mathematics and Philosophy, Mathematics and Economy, Biomathematics and Computational Biology, Computer Science, Scientific Computing, Physics, Master's Programme in Medical Physics and Teacher Education Programme in Mathematics, Science and Technology, but it can also be taken as an individual course.

Required reading

Course literature is decided by the departmental board and is described in an appendix to the syllabus.