# Syllabus

for course at advanced level

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| **Optimization II** | **7.5 Higher Education** |
| **Optimering II** | **Credits** |
| | **7.5 ECTS credits** |

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| **Course code:** | MM8015 |
| **Valid from:** | Spring 2009 |
| **Date of approval:** | 2009-03-02 |
| **Department** | Department of Mathematics (incl. Math. Statistics) |
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| **Subject** | Mathematics |
| **Specialisation:** | AXX - Second cycle, in-depth level of the course cannot be classified |

### Decision

This syllabus was approved by the Board of the Faculty of Science at Stockholm University on 2 March 2009.

### Prerequisites and special admittance requirements

Admission to the course requires knowledge equivalent to 90 credits in mathematics, where Foundations of Analysis, 7.5 credits (MM7001), and Optimization 7.5 credits (MM7006), or equivalent, are included. English B/English 6 or equivalent.

### Course structure

| Examination code | Name | Higher Education Credits |
|---|---|---|
| F815 | Optimization II | 7.5 |

### Course content

The course covers: The theory of convex sets and convex functions and their connections to different methods in continuous and discrete optimization. These topics include constraint qualification, Lagrange multiplier theory, Lagrangian and conjugate/Fenchel duality, minimax theory and nondifferentiable optimization. In addition the following topics will be dealt with on demand: network programming, mathematical treatment of optimization algorithms, optimization in Hilbert spaces, applications in natural sciences, mathematical economics and finance.

### Learning outcomes

After the course, students are expected to be able to:
* account for convex functions and convex sets and their role in optimization problems
* account for the mathematical theory behind different methods in continuous and discrete optimization
* use advanced methods in optimization to solve applied problems in the natural and social sciences.

### Education

Instruction consists of seminars and/or exercises and supervision of group work. There may be obligatory submitted work. In the event of special circumstances, the examiner may, after consultation with the teacher concerned, grant a student exemption from the obligation to participate in certain compulsory instruction.

### Forms of examination

a. The course is examined as follows: Knowledge assessment takes the form of written and/or oral 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 together with participation in all compulsory instruction and, the case being, approved submitted work.

e. Students who fail an ordinary examination are entitled to take at least further four examinations, as long as the course is given. 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 that a different teacher be appointed to set the grade of the course. Any such request must be made to the departmental board.

**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.

**Misc**
The course is a component of the Master's Programme in Applied Mathematics, but it can also be taken as an individual course.

**Required reading**
Course literature is decided by the departmental board and described thereafter in an appendix to the course plan.