Department of Mathematics
(incl. Math. Statistics)

Stockholm University

# Syllabus

for course at advanced level

**Dynamic Systems and Optimal Control Theory**
**Dynamiska system och optimal kontrollteori**

**7.5 Higher Education Credits**
**7.5 ECTS credits**

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|---|---|
| **Course code:** | MM7010 |
| **Valid from:** | Autumn 2007 |
| **Date of approval:** | 2006-09-27 |
| **Department** | Department of Mathematics (incl. Math. Statistics) |
| **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 27 September 2006.

## Prerequisites and special admittance requirements

Admission to the course requires knowledge equivalent to 60 credits in mathematics, where Mathematical analysis III, 7.5 credits, and Linear algebra II, 7.5 credits, or equivalent, are included. Also required is knowledge equivalent to Swedish upper secondary course English B.

## Course structure

| Examination code | Name | Higher Education Credits |
|---|---|---|
| F710 | Dynamic systems | 7.5 |

## Course content

The course covers:
Linear systems of differential equations, stability theory, basic concepts in control theory, Pontryagin's maximum principle, selected topics in dynamic programming, linear quadratic optimal control, Kalman filter or Luenberger observer, introduction to chaos and bifurcation. The contents of the course can be applied in modelling in a number of fields, for example in physics and economics.

## Learning outcomes

After the course, students are expected to be able to:
* define basic concepts in the theory of dynamic systems and optimal control theory
* account for and prove basic theorems in dynamic systems and optimal control theory
* explain and use methods in dynamic systems and optimal control theory to solve mathematical and applied problems.

## Education

Instruction consists of lectures and exercises.

## 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.

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.

### 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.

### Limitations

The course may not be included in a degree together with the course Dynamic systems and optimal control theory (MA3250).

### Misc

The course is a component of the Master's programme in applied mathematics, and can be included in 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 described thereafter in an appendix to the course plan.