Syllabus

for course at advanced level

Dynamic Systems and Optimal Control Theory	**7.5 Higher Education**
Dynamiska system och optimal kontrollteori	**Credits**
	7.5 ECTS credits

Course code:	MM7027
Valid from:	Spring 2022
Date of approval:	2021-06-17
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 course syllabus was approved by the Board of Science at Stockholm University on 2021-06-17.

Prerequisites and special admittance requirements

Admission to the course requires knowledge equivalent to 60 credits in mathematics or mathematical statistics, including the courses Mathematics II - Analysis, part A, 7.5 credits (MM5010) and Mathematics II - Linear algebra, 7.5 credits (MM5012), or equivalent.

Course structure

Examination code	Name	Higher Education Credits
HELA	Dynamical systems and optimal control theory	7.5

Course content

The course covers:
Linear systems of differential equations, stability theory, basic concepts in control theory, Pontryagin's maximum principle, dynamical programming (in particular linear quadratic optimal control). The contents of the course can be applied in modelling in a number of fields, for example in physics, machine learning, artificial intelligence, 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

Teaching consists of lectures and seminars.

The course is offered in English.

Forms of examination

a. The course is examined as follows: Assessment takes place through written exam and assignments.

The examination will be conducted in English.

The examiner can decide on adapted or alternative examination formats for students with disabilities.

b. The course has no compulsory instruction.

c. The course's final grade is set according to a seven-point criterion-referenced scale:
A = Excellent
B = Very good
C = Good
D = Satisfactory
E = Adequate
Fx = Failed, some additional work is required
F = Failed, much additional work is required

d. The course's grading criteria are handed out at the start of the course.

e. Students who receive a failing grade on a regular examination are allowed to retake the examination as long as the course is still provided. The number of examination opportunities is not limited. Other mandatory course elements are equated with examinations. A student who has received a passing grade on an examination may not retake the examination to attain a higher grade. A student who has failed the same examination twice is entitled to have another examiner appointed, unless there are special reasons to the contrary. Such requests should be made to the department board. Under normal circumstances, the course includes at least three examination opportunities per academic year the course is offered. For the academic years that the course is not offered, at least one examination opportunity is offered.

f. There is no possibility to improve the grade Fx to a pass grade in this course.

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 the course was discontinued. Requests must be made to the departmental board. The provision also applies in the case of revisions of the course syllabus and revisions of the required reading.

Limitations
This course may not be included in a degree together with the courses Dynamic systems and optimal control theory (MM7010).

Misc
This course is offered as a separate course, but may also be included in the Master's programme in mathematics.

Additional recommended knowledge for taking the course is Mathematics III - Ordinary Differential Equations, 7.5 credits (MM5026).

Required reading
The required reading is decided by the department board and published on course's page in the digital course catalogue at least 2 months before the start of the course.