Department of Mathematics
(incl. Math. Statistics)

Stockholm University

Syllabus

for course at advanced level

Brownian motion and stochastic differential equations
Brownsk rörelse och stokastiska differentialekvationer

7.5 Higher Education Credits
7.5 ECTS credits

Course code:	MT7043
Valid from:	Autumn 2022
Date of approval:	2021-09-16
Department	Department of Mathematics (incl. Math. Statistics)
Main field:	Mathematical Statistics
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 2021-09-16.

Prerequisites and special admittance requirements

For admission to the course, knowledge is required equivalent to 60 credits in mathematics or mathematical statistics including the course Stochastic Processes and Simulation I, 7.5 credits (MT4002), and at least one of the courses Probability Theory II, 7.5 credits (MT5002) and Mathematics III - Foundations of Analysis, 7.5 credits (MM5021). Also required is knowledge equivalent to Swedish upper secondary school course English B/English 6.

Course structure

Examination code	Name	Higher Education Credits
HELA	BM and SDE	7.5

Course content

The course treats Brownian motion (the Wiener process), Itô integrals, Itô's formula and stochastic differential equations as well as their properties and relations to partial differential equations. The course also covers optimal stopping theory and the theory of optimal stochastic control, as well as applications. In addition, some basic concepts of measure theoretic probability theory is treated.

Learning outcomes

After having completed the course the student is expected to be able to

- account for the theory of Brownian motion, Itô-integrals and stochastic differential equations, including their relations to partial differential equations, and optimal stopping theory and the theory of optimal stochastic control;

- solve problems related the above mentioned theory.

Education

Teaching consists of lectures, and exercise sessions.

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 assignments will not be graded in case of late submission. However, the examiner should take special circumstances into account.

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

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.

Misc

This course can be taken as part of the Master Programs in Insurance mathematics and Mathematical statistics, but it may also be taken as a separate course.

Required reading

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