



DEPARTMENT OF MATHEMATICAL SCIENCES

MMA630 Computational methods for stochastic differential equations, 7.5 credits

Beräkningsmetoder för stokastiska differentialekvationer, 7,5 högskolepoäng

Second Cycle

Confirmation

This course syllabus was confirmed by Department of Mathematical Sciences on 2018-08-13 to be valid from 2018-08-15, spring semester of 2019.

Field of education: Science 100%

Department: Department of Mathematical Sciences

Position in the educational system

The course can be part of the following programme: 1) Mathematical Sciences, Master's Programme (N2MAT)

Main field of studies

Mathematics

Specialization

A1F, Second cycle, has second-cycle course/s as entry requirements

Entry requirements

General entry requirements and the equivalent of the courses *MSA350 Stochastic Calculus* and *MMG800 Partial Differential Equations*.

Learning outcomes

On successful completion of the course the student will be able to:

- compute quantities of interest of solutions to stochastic differential equations (SDEs) with SDE approximation schemes and Monte Carlo methods,
- derive partial differential equations corresponding to the quantities of interest,
- compute solutions to the derived partial differential equations with finite element methods,

- analyze the errors of the used approximations.

Course content

Euler--Maruyama and Milstein approximations of solutions to stochastic differential equations. Strong and weak convergence analysis. Monte Carlo and multilevel Monte Carlo methods. Kolmogorov backward equations. Approximation of solutions to these partial differential equations with finite element methods. Error analysis. Computational complexity. Applications in finance and engineering.

Form of teaching

Language of instruction: English

Assessment

There will be a written examination at the end of the course. During the course, there may be optional assignments that give bonus points on the exam. Examples of such assignments are small written tests, labs, and oral or written presentations. Information about this is found on the course home page.

If a student, who has failed the same examined component twice, wishes to change examiner before the next examination, a written application shall be sent to the department responsible for the course and shall be granted unless there are special reasons to the contrary (Chapter 6, Section 22 of Higher Education Ordinance).

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

Course evaluation

The course is evaluated with an anonymous questionnaire and/or a discussion with the student representatives. The results of and possible changes to the course will be shared with students who participated in the evaluation and students who are starting the course.

Additional information

For a list of course literature, see:

<https://www.chalmers.se/sv/institutioner/math/utbildning/grundutbildning-goteborgs-universitet/kurslitteratur/Sidor/Kurslitteratur-i-matematik.aspx>