



FSF3971 Optimal Stochastic Control and Backward Stochastic Differential Equations 7.5 credits

Optimal stokastisk kontroll och bakåt stokastiska differentialekvationer

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for FSF3971 valid from Spring 2019

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

A Master's degree in mathematics, applied mathematics or related field including at least 30 ECTS in mathematics and SF3940 Probability.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After completing the course the students are expected to

- Explain the dynamic programming principle and its connection to partial differential equations
- Have a good understanding of the maximum principle
- Have a good understanding of backward stochastic differential equations.
- Outline the foundations mean-field games and its relation to control and BSDEs
- Explain and motivate the methods in different applications
- Be able to solve problems and discuss research questions related to the theory.

Course contents

1. Optimal control. Dynamic programming, the HJB Equation, the maximum principle
2. Backward stochastic differential equations.
3. Forward-backward stochastic differential equations. Duality.
4. Mean-field type control
5. Mean-field games
6. Applications

Disposition

Weekly lectures.

Course literature

The literature consists of a draft of the following book:

T. Basar, B. Djehiche and H. Tembine (2014-2017), Mean-Field-Type Game: Foundations and New Directions

Examination

- HEM1 - Home assignments, 3.5 credits, grading scale: P, F
- TENM - Oral exam, 4.0 credits, grading scale: P, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Homework and an oral exam.

Other requirements for final grade

Homework and an oral exam.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.