FSF3951 Optimal Control and Filtering 5.0 credits

Optimal kontroll och filtrering

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 FSF3951 valid from Spring 2019

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

Masters degree in mathematics, or in computational mathematics or in computer science/engineering with at least 30 cu in mathematics and 20 cu in statistics.

Completed courses SF2940 Probability theory and SF2852 Optimal control or equivalent

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 linear quadratic regulator
- Outline the foundations of filtering theory including the Kalman filter, non-linear filtering and problems with partial information
- Explain and motivate the use of equilibrium models in economics
- Be able to solve problems and discuss research questions related to the theory

Course contents

- Optimal control. Dynamic programming and the HJB Equation, the Verification Theorem. The linear quadratic regulator. Optimal investment theory and the Merton fund separation theorems. The martingale approach to optimal investment problems.
- Filtering. Nonlinear filtering and the Fujisaki-Kallianpur-Kunita equations. The Kalman and Wenham filters. Optimal control problems under partial observations. The partially observed linear quadratic regulator. Optimal investment under partial information.
- Equilibrium models in economics. The simplest production and endowment equilibrium models in continuous time.

Course literature

The literature consists of lecture notes which will be downloadable during the course.

Examination

- HEM1 - Home assignments, 5.0 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.

Other requirements for final grade

Masters degree in mathematics, or in computational mathematics or in computer science/engineering with at least 30 cu in mathematics and 20 cu in statistics.

Completed courses SF2940 Probability theory and SF2852 Optimal control or equivalent.

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.