FSF3632 Topics in Applied Algebraic Geometry 7.5 credits

Teman inom tillämpad algebraisk geometri

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 FSF3632 valid from Spring 2019

Grading scale

G

Education cycle

Third cycle

Specific prerequisites

Knowledge of basic algebra. A basic knowledge of algebraic geometry is desirable but not required.

Language of instruction

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

Intended learning outcomes

The students will get a deep understanding of the mathematical theory and the algorithms used in practice in numerical algebraic geometry.

After completing the course, the student should be able to work with:

- Gröbner bases,
- binomial ideals,
- homotopy continuation,
- basic intersection theory,
- elimination.

Course contents

The course will focus on two main applications of computational algebraic geometrical tools:

- Biochemical reaction networks modeled by mass-action kinetics
- The 7-bar inverse problem in Kinematics

The introductory material will include:

- Algebraic Varieties
- Basics on intersections of Algebraic subvarieties
- Directed graphs
- binomial ideals
- elimination and implicitization

Disposition

The course is given as a series of lectures (approx 15 x 2h).

Course literature

Notes from the lectures. Literature reference will include:

- Cox, Little, O-Shea, Ideals, Varieties, and Algorithms: An Introduction to Computational Algebraic Geometry and Commutative Algebra .
- Biochemical reaction networks: an invitation for algebraic geometers. MCA 2013, Contemporary Mathematics 656 (2016), 65-83. Pre-final version available at: http://mate.dm.uba.ar/~alidick/papers/MCA0215.pdf
- Selig, Geometric Fundamentals of Robotics,
- Sommese, Wampler, The Numerical Solution of Systems of Polynomials Arising in Engineering and Science. World Scientific press.

Examination

- INL1 - Assignment, 7.5 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.

Take home assignments and possibly oral presentations.

Other requirements for final grade

Take home assignments (and oral presentation) completed.

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.