



# FSF3611 Algebraic Stacks 7.5 credits

## Algebraiska stackar

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

## Establishment

Course syllabus for FSF3611 valid from Spring 2017

## Grading scale

G

## Education cycle

Third cycle

## Specific prerequisites

Solid background in algebraic geometry. In particular:

- good understanding of scheme theory (proficient in Hartshorne Ch. II, preferably also Ch. III or at least basic knowledge of flat and étale morphisms, see [O, Ch. 1]).
- good comprehension of Grothendieck topologies (see [O, Ch. 2.1–2.2] and [V]).

Suitable prerequisites are the courses SF3605 Algebraic Geometry II and SF3606 Algebraic Geometry III or SF3607 Étale cohomology.

## 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 student should be proficient in the foundations of algebraic stacks and have more in-depth knowledge in some topics. In particular, the student should

- have a thorough understanding of the 2-category of stacks (fibered categories) and the 1-category of algebraic spaces;
- have a good knowledge and understanding of the basic results on algebraic spaces and stacks including points, automorphisms, residual gerbes, characterizations of Deligne–Mumford stacks, quotients, and coarse moduli spaces;
- be able to do basic calculations with torsors, gerbes and root stacks;
- be able to read research papers on algebraic stacks;
- be able to explain how Artin algebraization follows from Artin approximation and the ideas behind Artin's axioms and the local structure theorem for algebraic stacks; and
- have a cursory knowledge of other fundamental results such as Chow's lemma, finiteness of cohomology and flat presentations.

## Course contents

- fibered categories, descent and stacks
- algebraic spaces and algebraic stacks
- quotients of group actions, torsors, gerbes, root stacks and coarse moduli spaces
- Artin approximation and Artin's axioms for algebraicity
- local structure of Artin stacks
- (brief overview of) flat presentations, sheaves in the lisse-étale site, Chow's lemma, finiteness of cohomology, derived categories of sheaves.

## Disposition

The course is given as a series of lectures (approx 15 x 2h). Most of the lectures are given by the participants.

## Course literature

### Main text-book:

[O] M. Olsson, Algebraic stacks, 2016 (AMS Bookstore)

### Other references:

[Alp] J. Alper, Artin algebraization and quotient stacks, Lecture notes from summer school in Mainz, 2015. (arXiv:1510.07804)

[BCEFFGK] Behrend, Conrad, Edidin, Fantechi, Fulton, Göttsche, Kresch, Algebraic stacks, in preparation. (version available on Kresch's web page)

[K] D. Knutson, Algebraic spaces, 1971.

[LMB] G. Laumon & L. Moret-Bailly, Champs Algébriques, 2000.

[V] A. Vistoli, Grothendieck topologies, fibered categories and descent theory, FGA Explained, Part 1, 2005.

## Examination

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.

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

This is a reading course where each participant reads all the material on their own and in addition plans and presents lectures. There are also exercises that are to be solved and then discussed in class.

## Other requirements for final grade

Lecturing, solving exercises and active participation in discussions.

## 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.