

Logic toolbox for mainstream mathematicians, fall 2015

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Lectures and exercise class on Thursday 15.10. and Friday 16.10. cancelled (lecturer still ill). Also the exam is postponed - see your mail for details.

Teacher: [Åsa Hirvonen](#)

Scope: 5 cr

Type: Advanced studies

Teaching: Period I, lectures Mon 10-12, Thu 14-16, exercise class Fri 10-12.

Topics: We look at methods from logic useful in other areas of mathematics, such as basic cardinal arithmetic, transfinite induction, ultraproducts and, time permitting, Martins Axiom.

Prerequisites: The course does not require previous knowledge of logic, but some 'mathematical routine' is assumed. (the course is primarily aimed at master's and graduate students)

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News

- The first lecture is on Monday 31.8. at 10-12
- We start exercises already the first week with warm up exercises (done on site).

Teaching schedule

Weeks 36-42, Monday 10-12 and Thursday 14-16 in room B120. In addition, two hours of exercise classes per week.

Exams & project

There will be a final exam of the course on **Wednesday 21.10. at 12-14.30 in the large auditorium (A111)**.

The deadline for the project is 1.11.2015.

The course is evaluated based on the exam (max. 24p), a project work (max 12p) and the exercises (max 6p). The project can be rather freely chosen as long as it relates to the theme of using logical tools in mathematics. It should be around 3-4 typed pages long. Examples of suitable projects are

- the Cantor-Bendixon rank
- some not too trivial application of transfinite induction (e.g. Goodstein's theorem)
- Fodor's lemma
- comparing Banach space ultraproducts to ultraproducts
- infinitesimals via ultraproducts
- applications of MA in analysis (or some other suitable field)

Course material

[Ordinals](#) (corrected 3.9.)
[Transfinite induction and recursion](#)
[Cardinals](#)
[Ultraproducts](#)

[Appendix: ZFC axioms](#)

Lecture notes will appear here during the course. For a more thorough treatment (or a sneak preview of the subjects) you can consult e.g.

H. Enderton: Elements of set theory, Academic press. (intro to set theory; thorough intro to ordinals and cardinals)
K. Kunen: Set Theory An Introduction to Independence Proofs, Elsevier. (more set theory; cardinal arithmetic and Martin's axiom)
C. C. Chang, H. J. Keisler: Model Theory, Elsevier. (model theory; ultraproducts, also has an intro to ordinals and cardinals in the appendix)

Registration

Did you forget to register? [What to do?](#)

Exercises

Assignments

- [Exercises 1](#) (warm-up exercises, done on site)
- [Exercises 2](#) (corrected 8.9.)
- [Exercises 3](#)
- [Exercises 4](#)
- [Exercises 5](#)
- [Exercises 6](#)
- [Exercises 7](#)

Exercise classes

Group	Day	Time	Room	Instructor
1.	Friday	10-12	C123	Åsa Hirvonen

Logbook

31.8. Ordinals.
3.9. Transfinite induction
7.9. Transfinite recursion, cardinality
10.9. Cardinal arithmetic
14.9. more on cardinal arithmetic; use in induction
17.9. cofinality
21.9. structures and filters
24.9. ultraproducts
28.9. Los's theorem
1.10. Applications of Los's theorem (compactness, non-axiomatizability)
5.10. Martin's Axiom

Course feedback

Course feedback can be given at any point during the course. Click [here](#).