

PhD course

Michele Pra Baldi

Generalities

Title: **Introduction to algebraic logic**

Teacher: **Michele Pra Baldi**

Duration: **20 hours (9 classes)**

The course will be held online on the Microsoft Teams' platform.

Description

The aim of this course is to introduce some basic topics and techniques of abstract algebraic logic. We begin by reviewing the constructions arising in universal algebra that will be instrumental for the rest of the course. In particular, we present some key properties of quasi-varieties and ultraproducts. We then focus on the semantics of matrices, with the ultimate goal of outlining the structure of the so-called Leibniz hierarchy. Special attention will be devoted to the order and model theoretic characterizations of each slots of the taxonomy. We will conclude by proving a milestone of the discipline: the isomorphism theorem for (weakly) algebraizable logics.

Classes will be held in english.

Calendar and synopsis

- **Tuesday 1st March 2022 from 10:00 to 11.30.** Basics of universal algebra. Class operators and (generalized) quasi-varieties.
- **Tuesday 8 March 2022 from 10:00 to 11.30.** Propositional logics and closure operators. Classical logic and the Lindenbaum-Tarski process.
- **Tuesday 15th March 2022 from 10:00 to 11.30.** Transformers, algebraic semantics and algebraizability.
- **Tuesday 22th March 2022 from 10:00 to 11.30..** Matrix semantics: deductive filters and models; strict homomorphisms and reduced models. The algebraic counterpart of a logic.
- **Tuesday 29st March 2022 from 10:00 to 11.30.** Protoalgebraic logics and deduction theorems;

- **Tuesday 5th April 2022 from 10:00 to 11.30.** Order and model theoretic characterizations of protoalgebraicity.
- **Tuesday 12th April 2022 from 10:00 to 11.30.** Truth equational and equivalential logics.
- **Tuesday 19st April 2022 from from 10:00 to 11.30.** The isomorphism theorem for (weakly) algebraizable logics.
- **Tuesday 26st April 2022 from 9:00 to 12.** Final test.

References

- [1] C. Bergman. *Universal Algebra: Fundamentals and Selected Topics*. Chapman & Hall Pure and Applied Mathematics. Chapman and Hall/CRC, 2011.
- [2] W. Blok and D. Pigozzi. *Algebraizable logics*, volume 396 of *Mem. Amer. Math. Soc.* A.M.S., 1989.
- [3] S. Burris and H. P. Sankappanavar. *A course in Universal Algebra*. Available in internet <https://www.math.uwaterloo.ca/snburris/htdocs/ualg.html>, the millennium edition, 2012.
- [4] J. Czelakowski. *Protoalgebraic logics*, volume 10 of *Trends in Logic—Studia Logica Library*. Kluwer Academic Publishers, Dordrecht, 2001.
- [5] J. Font. *Abstract Algebraic Logic: An Introductory Textbook*. College Publications, 2016.