

PhD course

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Generalities

Title: Introduction to algebraic logic

Teacher: Nicolò Zamperlin

Duration: 20 hours (10 classes), from November 2024 to January 2025.

Prerequisites: Proficiency in classical propositional logic (at least including the completeness theorem). Basic notions of order theory are helpful but not necessary.

The course will be held in person. Please contact me if you are interested in joining the course.

Content

The course is an introduction to the theory of algebraizability of Blok and Pigozzi. Through an analytic study of the first chapters of Font's handbook on algebraic logic we will first introduce the elementary notions of universal algebra needed for linking together logic and algebra (closure operators and their lattices, varieties, quasivarieties and equational consequences), then building upon these notions we will consider the case of implicative logics and their algebraic properties, introducing the technique of completeness through the Lindenbaum-Tarski process. Finally we generalize these notions to the class of algebraizable logics (with a glimpse to the larger Leibniz hierarchy), with the ultimate goal of proving the isomorphism theorem and the transfer for the deduction theorem. The course is also meant to provide the students with practical knowledge about the standard techniques in algebraic logic, therefore a certain amount of time will be dedicated to exercises.

References

Bergman, C., *Universal Algebra: Fundamentals and Selected Topics*, Chapman & Hall Pure and Applied Mathematics, Chapman and Hall/CRC, 2011.

Blok, W., and Pigozzi, D., *Algebraizable logics*, vol. 396 of *Memoirs of the American Mathematical Society*, A.M.S., 1989.

Burris, S., and Sankappanavar, H.P., *A course in Universal Algebra*, freely available online: <https://www.math.uwaterloo.ca/snburris/htdocs/ualg.html>, 2012 update.

Czelakowski, J., *Protoalgebraic logics*, vol. 10 of *Trends in Logic: Studia Logica Library*, Kluwer Academic Publishers, Dordrecht, 2001.

Font, J.M., *Abstract Algebraic Logic: An Introductory Textbook*, College Publications, 2016.