**Codes**: BMI-LOTD-416E.02

**Course**: Logic Programming: Knights, Knaves and Prolog

**Teacher**: Attila Molnár

**Location and time**: I/224, Tue 16:00-17:30

**Consultation**: Tue, 15:30 – 16:00, molnar.attila@szlgbp.hu, https://molnatt.github.io/prolog

**First occasion**: September 9, 2025, 16:00 – 17:30

**Courses required**: Logic seminar and lecture

**Requirements**: Homeworks

**Description**: The goal of this course is to introduce students to the fundamentals of the Prolog programming language and its application in sequent calculus derivations. Students will learn the basics of logical programming while gaining hands-on experience in applying sequent calculus to formal logical proofs and derivations.
Basic knowledge of mathematics and logic is required, but **prior programming experience is not necessary**.
Course Structure:
The course is divided into three phases, each building upon the previous one:

1. **Prolog Basics**: The first part of the course introduces the core concepts of the Prolog programming language. Students will learn the syntax and basic constructs of Prolog, such as:
   - Facts, rules, and queries
   - Backtracking and unification
   - Predicates, variables, and lists
   - Writing and testing simple Prolog programs
2. **Basics of Sequent Calculus**: In the second phase, students will study sequential calculus, a formal system of logical reasoning.
   - Basic rules and theorems
   - Sequents and deductions
   - The structure of sequent calculus and its use in logical problems
3. **Combining Prolog with Sequent Calculus:** In the final phase, students will learn how to use Prolog for sequent calculus derivations. The combination of Prolog's logical framework with the sequent calculus system allows for modeling complex logical systems and automating deductive reasoning.

**Course materials (slides, PDFs) will be available online throughout the course.**, and there is a very nice free online book about the Prolog programming language that we will follow very closely: Learn Prolog Now!

**Bibliography**:


[1] Patrick Blackburn, Johan Bos és Kristina Striegnitz. *Learn Prolog Now!* Originally available online since 2002. URL: `https://lpn.swi-prolog.org/`. College Publications, 2006.

[2] Gerhard Gentzen. "Investigations Into Logical Deduction". *American Philosophical Quarterly* 1.4 (1964), 288–306. old.

[3] Jean-Yves Girard, Yves Lafont és Paul Taylor. *Proofs and Types*. English translation available online. Cambridge University Press, 1989.


**Further readings**:


[1] Andrzej Indrzejczak. *Sequents and Trees: An Introduction to the Theory and Applications of Propositional Sequent Calculi*. Springer, 2021.

[2] Paolo Mancosu, Sergio Galvan és Richard Zach. *An Introduction to Proof Theory: Normalization, Cut-Elimination, and Consistency Proofs*. Oxford University Press, 2021.

[3] Sara Negri és Jan von Plato. *Structural Proof Theory*. Cambridge University Press, 2001.

[4] Nicholas J. J. Smith. *Logic: The Laws of Truth*. Princeton University Press, 2012.