Department of Philosophy

Phil 120: Symbolic Logic 1 — *Katalin Bimbo*

[Course description — Fall term (2018)]

Logic comprises formal theories that are suitable as models of *correct reasoning* in various fields. This course is an introduction to *classical first-order logic* (**FOL**), which is one of the easiest logics to learn.

FOL has been investigated for well over 100 years, and there is an immense amount of accumulated knowledge about this logic. (In the course, we will only sample some of the basics though.) **FOL** has *many applications* in various disciplines, for example, in informatics, computer science, philosophy, mathematics and artificial intelligence. A reliable understanding of **FOL** is often essential in learning further logics such as modal, substructural, relevance, dynamic, quantum and higher-order logics. Experimental evidence shows that studying formal logic improves the learner's everyday informal *reasoning skills* too.

The course will use a textbook written by the famous and highly accomplished logician Raymond M. Smullyan. We will start the course with solving puzzles, in which the concept of truth and apt reasoning are the requisites to obtain a solution. These simple puzzles are formulated in English and they introduce some of the core notions of classical logic. The puzzles can be solved without using a formal language or calculus — just like one might proceed to solve an everyday reasoning problem — but it is easier to solve them once they are formalized. The first formal system that we will look at is *sentential logic* (**SL**). You will learn the syntax and the semantics of **SL**. Paramount concepts in this part of the course include truth-functional connectives, well-formed formulas, truth values, truth functions and truth tables, among others. **SL**, however, has a rather limited expressive power, which is considerably extended in **FOL** by the addition of the *quantifiers* "for all" and "there exists." The introduction of the quantifiers elicits a new way of thinking about the syntax of a logic, because quantifiers are concrete examples of the abstract concept of operators (in the sense of Church).

Formalizing reasoning — especially, formalizing complicated inferences — is the initial step toward deciding their worth. The next step is to establish whether the conclusions can or cannot be proved from the premises (whenever such a determination is possible). *Analytic tableaux* are one of the ways to go about the latter. In this course, you can learn this approach in a *unified* framework, which was originally developed by the author of the textbook.

Time: M, W, F 13:00 pm–13:50 pm

Textbook: Smullyan, R. M., *Logical Labyrinths*, AK Peters, Ltd., Wellesley, MA, 2009.

For **further information**, please contact the instructor at `<bimbo@ualberta.ca>`
The (official) **course outline** is available in the e-classroom during the course.