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Department of Philosophy

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**PHIL 422/PHIL 522: APPLIED LOGIC**

*Katalin Bimbo*

(Course description — Winter term (2025))

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Logic is a large area of knowledge, which originated in philosophy and it is a core area of philosophy. The expansion of logic since the late 19th century increased the number of logics and the scope of applications of logics. This course will sample some logics that are better known and have important applications, especially those mentioned in what follows.

*Boolean logic* dates back to the work of G. Boole, and it is the most widely used logic nowadays. Every computer or device with significant computing power has a CPU, the operation of which can be described in terms of logic gates. This is a very practical use of the Boolean logic; however, it has more theoretical applications such as furnishing the first provably NP-complete problem (in complexity theory). The *quantified* version of *2-valued logic* provided the base theory for a range of mathematical theories, from Euclidean geometry to arithmetic and analysis. However, some mathematicians (mainly, formalists and intuitionists) deemed certain principles and rules unsafe, which led to the introduction of *intuitionistic logic*. *Modal logics* originated in philosophy and focused on notions of possibility and necessity; however, some modal logics can deal with concepts of time or the execution of computer programs. The current age of information forces both computers and human beings to handle inconsistent, incomplete and fluid information. *3- and 4-valued logics* and *default logic* create room for reasoning about beliefs that may not reach the idealized level of knowledge. The idea of computation can be expressed abstractly in *combinatory logic* and the  $\lambda$ -*calculuses*, which are not only elegant (and admittedly, abstract) frameworks for the task, but also have applications in the area of programming languages. Philosophers have been keen on delineating a more refined concept of logical consequence (than  $\text{FOR}$ 's concept) since the beginning of the 20th century. *Relevance logics* provide some of the tools that scholars thinking about abstract notions require.

[The official prerequisite for the Phil 422 course is Phil 220. The prerequisite may be waived in certain cases upon request. Phil 522 has no official prerequisite.]

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**Time:** M, W, F 12:00 pm–12:50 pm

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**Texts:** The course will utilize a variety of resources (from papers in journals to chapters in monographs), most of which will be available online (through the Library of the University of Alberta).

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

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