Modal Logic: An Introduction
A proposal of a seminar for Erasmus+ students

Dr. Marcin Drofiszyn & Dr. Marcin Łazarz
Department of Logic and Methodology of Sciences
University of Wrocław

Course Description

This course is an introduction to modal logic. We start with the discussion of the philosophical motivations of modal expressions such as

"it is necessary that . . . "   "it is obligatory that. . . "

"it is possible that. . . "   "it is permitted that"

"it is impossibe that. . . "   "it is forbidden that. . . "

etc. Further, we define a formal language and present an axiom system of the well-known modal logic called *Standard Deontic Logic*, SDL for short. Basic theorems of SDL and basic metatheorems on SDL are proven. Next, we introduce the Kripke-style semantics for SDL, and prove the completeness theorem i.e., the theorem which states that syntactic and semantic descriptions coincide.

Modifying semantic structures we describe a several important modal logics such as: Lewis logics S4 and S5, Wiśniewski's epistemic logic, and temporal logic. We indicate its philosophical interpretations and syntactic characterizations. We finish with some application of modal logic to such philosophical iusses as ontological argument for the existence of God and problem of moral dilemmas.

Course Learning Outcomes

The students will learn the fundamentals of modal logic. In particular, they will be expected to familiarize themselves with:

the philosophical origins, problems, and paradoxes of modal concepts,

syntactic concepts and metatheorems, including, the concept of formal proof,

procedures for testing satisfiability, validity, and consequence, in selected modal calculi.

methods of formalizing and analyzing philosophical problems by means of tools of modal logic.

Prerequisites

None.

Form of assessment

Attendance, active participation in classes, presentation.

Recommended literature

[1] B. F. Chellas, *Modal Logic: An Introduction*, Cambridge University Press, 1980.

[2] R. Epstein, *The Semantic Foundations of Logic, Vol. 1: Propositional Logics*, Springer (Nijhoff International Philosophy Series 35), 1990.

[3] J. Garson, *Modal Logic*, in: Stanford Encyclopedia of Philosophy, 2000, `https://plato.stanford.edu/entries/logic-modal/`

[4] V. Hendricks, J. Symons, *Epistemic Logic*, in: Stanford Encyclopedia of Philosophy, 2006, `https://plato.stanford.edu/entries/logic-epistemic/`

[5] T. C. McConnell, *Moral dilemmas and consistency in ethics*, in: C. W. Gowans (ed.), *Moral dilemmas*, Oxford University Press, New York–Oxford 1987, 154–168.

[6] P. McNamara, *Deontic Logic*, in: Stanford Encyclopedia of Philosophy, 2006, `https://plato.stanford.edu/entries/logic-deontic/`

[7] D. Rönnedal, *An Introduction to Deontic Logic*, Create Space Independent Publis, Lexington 2017.