Topics in Logic: Modal Logic Seminar

CMU 80-714
Spring 2009

Course Information

Time: Mondays 3:30–6:20
Place: BH 150
Instructors: Steve Awodey (awodey@cmu.edu)
and Kohei Kishida (kok6@pitt.edu)
Office Hours: by appointment

Description

A graduate-level seminar in modal logic. We will cover some formal systems and semantics, as well as some related philosophical topics.

The first half of the course will deal with propositional modal logic. We will start with standard systems of modal logic and Kripke semantics, and then cover other frameworks, most notably neighborhood semantics. We will also discuss some of the philosophical interpretations — temporal, epistemic, etc.—of modal operators. The second half will deal with quantified and first-order modal logic. After briefly reviewing classical philosophical discussions concerning the interaction between modality and first-order notions, we will discuss how the first-order vocabulary is or should be interpreted in the Kripke and other frameworks.

The course will typically proceed by alternating between, on the one hand, philosophical topics that may be raised concerning formal systems or that may motivate mathematical implementations, and on the other hand mathematical formulations that may respond to conceptual demands or that may give rise to further philosophical issues.

Topics to be Treated

- Propositional modal logic: Basic systems
- Propositional modal logic: Philosophical topics
- Propositional modal logic: Kripke semantics
- Applications: temporal, dynamic, epistemic, and provability logics

- Topological semantics, intuitionistic logic, and the Gödel translation
- Propositional modal logic: Neighborhood semantics
- Quantified modal logic: Philosophical issues
- Quantified modal logic: Kripke semantics
- Quantified modal logic: General semantics

Requirements and Evaluation

Participants should assume responsibility for one topic (preferably from those above), and present the material for one class session. In addition, everyone should prepare for each meeting by doing the suggested reading in advance. There will also be occasional exercises which are useful for developing technical skill and testing ones understanding. These should be solved each week and will then be discussed in class.

Each student should submit some written work at the end of the semester: either a write-up of their in-class presentation or of the full set of homework problems with solutions.

Prerequisites

Students should have some background in logic through completeness for predicate logic.

Textbooks and Other Reading Material

The following textbook will not be required but it is recommended for students' reference (it is available in the Bookstore):

- Hughes and Cresswell: *A New Introduction to Modal Logic*, Routledge, 1996.

Further recommended texts for reference:

- Chellas: *Modal Logic, an Introduction*, Cambridge 1980.
- Blackburn, de Rijke, Venema: *Modal Logic*, Cambridge 2001.
- Goble, ed.: *The Blackwell Guide to Philosophical Logic*, Blackwell 2001.

Supplemental readings (to be supplied) will include selections from Carnap, Barcan-Marcus, Quine, Kripke, Scott, David Lewis and others.

General Outline of Meetings

Later dates are only tentative and will likely change depending also on the availability of guest lectures. Prof. Dana Scott will participate with several lectures in the second half of March.

Week 1, Jan. 12: Introduction and Organization

Week 2, Jan. 19: MLK Day, no class

Week 3, Jan. 26: Propositional Logic: Basic Systems

Week 4, Feb. 2: Propositional Logic: Philosophical issues

Week 5, Feb. 9: Propositional Logic: Kripke semantics

Week 6, Feb. 16: Applications: temporal, epistemic, dynamic, etc.

Week 7, Feb. 23: Propositional Logic: Topological semantics

Week 8, March 2: Propositional Logic: Neighborhood semantics

Week 9, March 9: Spring Break, no class

Week 10, March 16?: Quantified Logic: Philosophical issues

Week 11, March 23?: Quantified Logic: Kripke semantics

Week 12, March 30?: Quantified Logic: General semantics

Week 13, April 6?: Quantified Logic: Topics

Week 14, April 13?: Quantified Logic: Topics

Week 15, April 20?: Quantified Logic: Topics

Week 16, April 27: Last class meeting