

Lecturer: Dr. Alessandra Marra

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MCMP/ LMU Munich

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## **Modal Logic: Theory and Philosophical Applications**

### **Course Description and Objectives**

This course provides an introduction to modal logic, a striving field of research within formal philosophy. During the course, we will study modality in its various forms: alethic ("it is necessarily true that"), epistemic ("it is known that"), deontic ("it ought to be the case that"), temporal ("it has always been the case that"), among others. The course will have two main parts. The first part will cover core concepts and basic metatheory of propositional modal logic. The second part of the course will consider selected philosophical applications, ranging from epistemology to ethics and philosophy of time. At the end of the course, students will have a working knowledge of the basic techniques from propositional modal logic, and will be able to apply them to the analysis of notions like knowledge, beliefs, obligations, permissions and time.

### **Course Structure and Evaluation**

We will have two kinds of meetings on Tuesdays: an *exercise session* from 9(ct) to 10, followed by a *lecture* from 10(ct) to 11.45. After each lecture, the lecturer will post some exercises concerning the material covered in class. Those exercises will be presented by (at least) one student in the following exercise session. In the first week of the course, a doodle will be distributed to assign exercise sessions to students.

The final grade is determined by: a graded take-home exam + an ungraded mandatory exercise presentation.

### **General Information**

- Time: 09:00–10:00 cum tempore (exercise session) + 10:00–12:00 cum tempore (lecture)
- Location: in-person, room 021, Ludwigstr. 31.
- Lecturer: Alessandra Marra ([Alessandra.Marra@lrz.uni-muenchen.de](mailto:Alessandra.Marra@lrz.uni-muenchen.de))
  - You can address me as "Dr. Marra" or as "Alessandra".
  - Please let me know if you have a preferred pronoun.
- Office hours: By appointment

### **Lectures Schedule**

*Please note that the schedule might be subject to change.*

### *Part 1: Basic Concepts and Theory of Propositional Modal Logic*

#### *21.10 Language of Propositional Modal Logic*

Background readings: van Benthem, §2; (Blackburn/de Rijke/Venema: §1)

#### *28.10 Semantics of Propositional Modal Logic*

Background readings: van Benthem, §2; (Blackburn/de Rijke/Venema: §1)

#### *04.11 Expressive Power and Invariance*

Background readings: van Benthem, §3; (Blackburn/de Rijke/Venema: §2.1-2.2)

#### *11.11 Correspondence*

Background readings: van Benthem, §9.1-9.2; (Blackburn/de Rijke/Venema: § 3.1)

#### *18.11 The Finite Model Property*

Background readings: van Benthem, §4.2; (Blackburn/de Rijke/Venema: § 2.3)

#### *25.11 Semantic and Syntactic Consequence Relations*

Background readings: van Benthem, §5.

#### *02.12 Soundness and Completeness I*

Background readings: van Benthem, § 5; (Blackburn/de Rijke/Venema: § 4.1-4.2)

#### *09.12 Soundness and Completeness II*

Background readings: van Benthem, §5; (Blackburn/de Rijke/Venema: § 4.1-4.2)

### *Part 2: Philosophical Applications*

#### *16.12 Temporal Logic*

Background readings: Fitting and Mendelsohn 1998, §1.10, 35-40; van Benthem, §18.1-18.3; MacFarlane 2003

### 23.12 *Deontic Logic I*

Background readings: Hilpinen and McNamara, §6, 7.1-7.2, 8.5.

### 13.01 *Deontic Logic II*

Background readings: Hilpinen and McNamara, §6, 7.1-7.2, 8.5; Chisholm 1963

### 20.01 *Logic of Action*

Background readings: Horty 2001, §2-3.

### 27.01 *Epistemic Logic*

Background readings: van Benthem, ch. 12, §13.1-13.3; Holliday 2012; Stalnaker 2006

### 03.02 *Dynamic Epistemic Logic*

Background readings: van Benthem, §15.1-15.4, §15.6

### 10.02 Recap

## Readings

Johan van Benthem. *Modal Logic for Open Minds*, CSLI 2010

Patrick Blackburn, Maarten de Rijke and Yde Venema: *Modal Logic*, Cambridge University Press 2010

Roderick M. Chisholm. *Contrary-to-Duty Imperatives and Deontic Logic*. *Analysis*, Vol.24, No2, 1963

Melvin Fitting and Richard L. Mendelsohn. *First-Order Modal Logic*. Kluwer, Dordrecht, 1998.

Risto Hilpinen and Paul McNamara. *Deontic Logic: A Historical Survey and Introduction*. In Dov Gabbay et al. editors, *Handbook of Deontic Logic and Normative Systems*. College Publications, 2013

Wesley H. Holliday. *Epistemic Logic and Epistemology*. In S.O. Hansson and V.F. Hendricks editors, *Handbook of Formal Philosophy*. Springer, 2012. Forthcoming.

John Horty. *Agency and Deontic Logic*. OUP, 2001

John MacFarlane. *Future Contingents and Relative Truth*. *The Philosophical Quarterly*, 53(212): 321–336, 2003

Robert Stalnaker. *On Logics of Knowledge and Belief*. *Philosophical Studies*, 128(1): 169–199, 2006.