



COURSE PRESENTATION FORM – ACADEMIC YEAR 2010/2011

COURSE NAME	Non-classical Logic
COURSE CODE	72070 (MSc 270) / 70174 (BSc, MSc 509)
LECTURER	Alessandro Mosca
TEACHING ASSISTANTS	--
TEACHING LANGUAGE	English
CREDIT POINTS	4
LECTURE HOURS	24
EXERCISE HOURS	12
TIME SPAN	21.02.2011 - 11.06.2011
TIME TABLE	See Timetable Page
OFFICE HOURS LECTURER	During the lecture time, TBD, Faculty of CS, POS Building, piazza Domenicani 3 , office 3.05
OFFICE HOURS TEACHING ASSISTANT	--
PREREQUISITES	Basics of set-theory, as in the first chapter of "Sets for Mathematics", by F. W. Lawvere and R. Rosebrugh: http://assets.cambridge.org/054180/4442/sample/0541804442ws.pdf Basics of propositional logic and first-order logic.
OBJECTIVES	Modal logic is usually viewed as the logic of 'necessity' in philosophy, and of 'provability' in mathematics. But computer science has advocated another view: that of modal languages as compact yet expressive languages for describing relational structures, and as such modal logic is used in computational linguistics, formal methods, etc. This course will present the basics of modal logic, emphasizing its semantic and computational properties.
SYLLABUS	<ul style="list-style-type: none">• Basic concepts:<ul style="list-style-type: none">○ relational structures, in particular transition systems and trees;○ modal languages, examples and variants (e.g., propositional dynamic logic, arrow logic, description logic);○ semantics of modal logics;○ a (Hilbert style) proof system for modal logics, focusing on



- K, the basic modal logic.
- Models and satisfiability:
 - models;
 - basic model construction techniques, e.g., disjoint unions and generated submodels;
 - bisimulations;
 - the standard translation, and a first appetizer of correspondence theory—that is, what is the correspondence between the satisfiability of modal logic and first-order logic?
- Frames and validity:
 - frames;
 - frame construction techniques, e.g., disjoint unions and generated subframes;
 - a second appetizer of correspondence theory.
- Soundness and (weak, strong) completeness.
- Computational modal logic: highlights.

TEACHING FORMAT

Frontal lectures.

ASSESSMENT

Final exam only, written or oral or both [100 % of mark]

READING LIST

The lecturer course web page lists the agenda with the mandatory material, namely,

- selected parts from the course textbook, Modal Logic, by P. Blackburn, M. de Rijke and Y. Venema, in Cambridge Tracts in Theoretical Computer Science, vol. 53 (available in the FUB library),
- mandatory notes and exercises for modal logic,
- selected parts from the Handbook of Modal Logic (available in the FUB library), P. Blackburn, J. van Benthem, and F. Wolter (eds).

SOFTWARE USED

None.

LEARNING OUTCOME

Students that complete this course unit are expected to

- have acquired a working knowledge and understanding of the semantics of modal logic,
- grasp the expressiveness and limitations of such logics, and their relations with other logics, e.g., between modal and first-order logics,
- understand why and how nonclassical logic can be useful in computing science.

More in general, students should

- get experienced in formalising computational problems (e.g., properties of labelled transition systems) in some expressive yet computationally well-behaved logic,
- expand their mathematical knowledge (e.g., by recognising the role of definitions and axioms) and reasoning skills (e.g., by reading, assessing and developing formal proofs),
- improve their communication skills by developing the habit of



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reading and expounding their reasoning.

COURSE PAGE

<http://www.inf.unibz.it/~mosca/Teaching.html>