



FOUNDATIONS OF LOGIC

Enrollment year	2013/2014
Academic year	2015/2016
Regulations	DM270
Academic discipline	M-FIL/02 (LOGIC AND PHILOSOPHY OF SCIENCE)
Department	DEPARTMENT OF CHEMISTRY
Course	CHEMISTRY
Curriculum	PERCORSO COMUNE
Year of study	3°
Period	1st semester (01/10/2015 - 20/01/2016)
ECTS	6
Lesson hours	60 lesson hours
Language	ITALIAN
Activity type	ORAL TEST
Teacher	MINARI PIERLUIGI (titolare) - 9 ECTS
Prerequisites	- Module A: no prerequisites - Module B: module A (or corresponding knowledges)
Learning outcomes	<p>Aim of the course is introducing students to (i) basic tools and techniques for the verification</p> <p>of the correctness of logical inferences (truth tables, refutation trees, natural deduction for</p> <p>first order logic FOL), (ii) the main notions of logical semantics (model, truth in a model,</p> <p>logical consequence), (iii) some key metalogical results (completeness theorem for FOL, with</p>

applications), (iv) non classical (in particular: modal and intuitionistic) logic and Kripke

semantics; (v) the basic notions of computability theory (Turing machines).

Course contents

(A.i) Logical truth, logical consequence, consistency: intuitive notions.

(A.ii) Logical form.

(A.iii) Propositional and predicate logic: basics (classical connectives and truth-tables; informal

semantics of quantification).

(A.iv) Propositional and predicate logic: refutation trees. Labelled trees; refutation trees;

counterexample extraction. Elementarily valid formulas and inferences.

(A.v) Classes, relations, functions, cardinality; Cantor's theorems.

(A.vi) Traditional logic (categorical propositions; traditional square of oppositions; syllogisms).

(B.i) Computability: basics (informal notions of algorithm, decidability, effective enumerability,

computability; Turing machines).

(B.ii) Elementary languages and model-theoretic semantics (inductive definitions and proofs by

induction; elementary languages; correspondence theory of truth; semantic paradoxes. Tarskian

semantics: structures and interpretations; satisfiability; logical consequence).

(B.iii) Syntax of elementary logic (informal notion of deduction; "Frege-Russell-Hilbert" vs

"Gentzen" paradigms; axiomatic calculi; Gentzen's natural deduction calculus NK).

(B.iv) Completeness theorem for FOL. Compactness and Löwenheim-Skolem theorems.

Applications.

(B.v) Modal logic and Intuitionistic logic. Kripke semantics.

Teaching methods

Lectures

Reccomended or required readings	<ul style="list-style-type: none"> - A. Cantini, P. Minari, Introduzione alla Logica. Mondadori Education 2009. - D. van Dalen, Logic and Structure. 5th ed., Springer 2013. - Lecture notes (online)
Assessment methods	Oral Examination
Further information	Oral Examination
Sustainable development goals - Agenda 2030	\$lbl legenda sviluppo sostenibile