unibz
Fakultät für Informatik
Facoltà di Scienze e Tecnologie informatiche
Faculty of Computer Science

SYLLABUS
COURSE DESCRIPTION

COURSE TITLE	**Discrete Mathematics and Logic**
COURSE CODE	75036
SCIENTIFIC SECTOR	M-FIL/02
DEGREE	Bachelor in Computer Science and Engineering
SEMESTER	1st Semester
YEAR	2nd
CREDITS	8

TOTAL LECTURING HOURS	48
TOTAL LAB HOURS	24
PREREQUISITES	There are no formal prerequisites in terms of courses to attend.
COURSE PAGE	https://ole.unibz.it/ and http://www.inf.unibz.it/~artale/DML/dml.htm

SPECIFIC EDUCATIONAL OBJECTIVES	• Type of course: " affini o integrativi" for L-31 and L-08 • Scientific area: "formazione affine" for L-31 and L-8 The aim of the course is to provide students with an understanding of the formal foundations of classical logic languages and related methodologies to reason over formal logical theories. An overview of the proof methods based on logics, and useful in mathematics and computer science, will be given. The course will also demonstrate the ability to use logic as a tool for representation and reasoning in computer science. The students will be trained to apply the Induction principle to various computer science settings and in particular to check the correctness of Algorithms via the notion of Loop Invariant. Furthermore, methods to analyse and describe the main properties of Relations, Functions, Graphs and Trees will also be studied as well as the principles governing the complex mathematical notion of Cardinality of a set including the notion of countable infinite sets.

LECTURER	Alessandro Artale, office POS 2.03 Faculty of CS, POS Building, Piazza Domenicani 3, artale@inf.unibz.it, +39 0471 016150 Web Page: http://www.inf.unibz.it/~artale Email: artale@inf.unibz.it

SCIENTIFIC SECTOR OF THE LECTURER	INF/01
TEACHING LANGUAGE	English
OFFICE HOURS	During the lecture time span, Office 2.03. To fix an appointment email at artale@inf.unibz.it
TEACHING ASSISTANT	Elena Botoeva, Piazza Domenicani, 3 – Office 2.06, botoeva@inf.unibz.it Daniele Porello, Piazza Domenicani, 3, – Office 3.03, Daniele.Porello@unibz.it
OFFICE HOURS	TBA
LIST OF TOPICS COVERED	Functions, Relations, Graphs and Trees • One-to-One and Onto Functions • Equivalence and Partial Order Relations • Trails, Paths, and Circuits (Euler and Hamiltonian) in a Graphs • Graph Isomorphism Proof Techniques/Induction • Loop Invariant Set Cardinality • Countably infinite sets and Uncountable sets Introduction to Logic Propositional Logic First-Order Logic Model Theory Proof Theory • Tableaux Calculus for Propositional and FOL • Soundness and Completeness proofs via Induction
TEACHING FORMAT	Frontal lectures, exercises in lab, mid-term exam.

LEARNING OUTCOMES	**Knowledge and understanding** • have a solid knowledge of mathematics and logics that are in support of computer science; **Applying knowledge and understanding** • be able to use the tools of mathematics and logics to solve problems; **Make judgments** • be able to collect useful data and to judge information systems and their applicability. • be able to work autonomously according to the own level of knowledge. **Communication skills** • be able to explain a project activity or a scientific study, also to non-experts; **Learning skills** • be able to learn the innovative features of state-of-the-art technologies and information systems; • have developed learning capabilities to pursue further studies with a high degree of autonomy.

ASSESSMENT	Written exam (with an optional mid-term written exam). In the written exam (including the optional mid-term exam) there will be verification questions, transfer of knowledge questions and exercises. The learning outcome related to knowledge and understanding, applying knowledge and understanding and those related to the student ability to learn and the acquired learning skills will be assessed by the written exam.
ASSESSMENT LANGUAGE	English

EVALUATION CRITERIA AND CRITERIA FOR AWARDING MARKS	• Mid-term Written Exam (optional, count as 50% of the full mark)
	• Final Written Exam
	  o 50% covering a reduced program for students who passed the mid-term exam, or
	  o 100% covering the full program in case of failure of the Mid-term.
	
	Written exam questions will be evaluated in term of correctness, clarity, quality of argumentation, problem solving ability.
	
	Note: In case of a positive mark the mid-term exam will count for 3 regular consecutive exam sessions.

REQUIRED READINGS	Mordechai Ben-Ari: Mathematical Logic for Computer Science, Springer-Verlag [Main book for Logic part] Susanna Epp: Discrete Mathematics with Applications, Cengage Learning, 4th edition. [Main book for Discrete Math part]
SUPPLEMENTARY READINGS	H. Enderton: A Mathematical Introduction to Logic, Academic Press. [Auxiliary book for Logic part] H. D. Ebbinghaus, J. Flum, W. Thomas: Mathematical Logic, Springer-Verlag. [Auxiliary book for Logic part] Kenneth Rosen: Discrete Mathematics and its Applications, McGraw-Hill, 7th edition. [Auxiliary book for Discrete Math part]
SOFTWARE USED	NA