COURSE DESCRIPTION – ACADEMIC YEAR 2016/2017

Course title	**Ontology and Database Systems**
Course code	74012
Scientific sector	INF/01
Degree	European Master's Program in Computational Logic (LM-18)
Semester	2
Year	1
Credits	12
Modular	Yes
University	UniBZ

Total lecturing hours	72
Total lab hours	36
Total exercise hours	--
Attendance	Not compulsory
Prerequisites	Notions of • First-order logic as taught in an introductory BSc course on Mathematical Logic; • Relational databases as taught in an introductory BSc course; • Java programming and SQL with JDBC Connectivity.
Course page	https://ole.unibz.it/

Specific educational objectives	The course belongs to the type "caratterizzanti – discipline informatiche". The course is part of the advanced topics offered within the degree and can be selected by the student as one of the three which must be completed according to the study plan. Research on ontologies is focussed on logic-based formalisms providing powerful deduction services with expressive conceptual languages and with high computational complexity. In contrast, database research deals with efficient storage and retrieval of large amounts of documents with simple languages. The module introduces current logic-based approaches trying to merge the two disciplines: formalisms and technologies related to problems concerning Conceptual Data Modelling and Ontology Design, Intelligent Information Access and Query processing, Database Theory, Information Integration, Peer to Peer Information Systems. The main objective is that upon completion of this module, students have a detailed understanding of how knowledge is formalized and processed in ontology research using description logics, and of problems and issues that have to be respected. They furthermore will have acquired skills in designing, formally specifying, and realizing techniques of conceptual design, database access and integration.

Module 1	**Knowledge Representation and Ontologies**
Module code	74012A
Module scientific sector	ING-INF/05
Lecturer	Diego Calvanese
Contact	Piazza Domenicani 3, Room 2.07, calvanese@inf.unibz.it, 0471-016160
Scientific sector of lecturer	ING-INF/05
Teaching language	English
Office hours	By appointment via mail.
Lecturing assistant (if any)	Guohui Xiao

Office hours LA	By appointment via mail.
Credits	8
Lecturing hours	48
Lab hours	--
Exercise hours	24
List of topics	• Modelling information through logic and through ontologies • Query answering over databases and ontologies • Modelling incomplete information • Description Logics • Ontology based data access • Reasoning in the DL-Lite family of Description Logics • Reasoning in the ALC family of Description Logics
Teaching format	The course is organized as frontal lectures on the course topics, possibly complemented by monographic seminars that serve as a starting point for discussing the techniques involved. During lab sessions the students will develop their theoretical skills by elaborating small problems and familiarize themselves with the usage and internals of state-of-the-art tools for managing and querying relational data sources through an ontology, and will work on a project.

Module 2	**Foundations of Databases**
Module code	74012B
Module scientific sector	INF/01
Lecturer	Werner Nutt
Contact	Piazza Domenicani 3, Room 2.09, nutt@inf.unibz.it, 0471-016126
Scientific sector of lecturer	INF/01
Teaching language	English
Office hours	By appointment via mail.
Lecturing assistant (if any)	--
Office hours LA	--
Credits	4
Lecturing hours	24
Lab hours	12
Exercise hours	--
List of topics	• Logic as a query languages • Foundations of query processing • Relational query languages with recursion
Teaching format	The course is organized as frontal lectures on the course topics, possibly complemented by monographic seminars that serve as a starting point for discussing the techniques involved. During lab sessions the students will develop their theoretical skills by elaborating small problems and familiarize themselves with the usage and internals of state-of-the-art tools for managing and querying relational data sources through an ontology, and will work on a project.

Learning outcomes	Knowledge and understanding • Knowledge of Description Logics • Understand the different application areas of computational logic wrt local and international economical contexts • Knowledge of the state of the art of knowledge representation and reasoning techniques

	• Knowledge of semantic techniques to extract knowledge from data • Broad knowledge of foundational and applicative areas of computer science Applying knowledge and understanding • Ability to analyse and solve concrete problems within the Computational Logic area • Ability to comprehend technical documents as conference proceeding, journal articles or technical manuals • Ability to provide an original solution to an applicative problem satisfying technical, functional and organisational constraints • Ability to summarise the content of technical documents using written reports and/or presentations Making judgments • Ability to establish achievable objectives considering time and resource constraints Communication skills • Ability to structure and write technical reports concerning project activities • Ability to collaborate with peers and expert within research or applicative projects Learning skills • Ability to extend possibly incomplete knowledge within problem solving activities directed to achieve specific goals

Assessment	The final mark will be based on: • a final oral or written exam [60–75% of mark] • a project [25% of mark] • written coursework [up to 15% of mark] To pass the exam, both the final exam (1) and the project (2) have to be passed, while the written coursework is optional.
Assessment language	English
Evaluation criteria and criteria for awarding marks	The final mark is computed as a weighted average of the exam mark (60-75%), the project mark (25%), and the coursework mark (up to 15%). If the coursework is accomplished, it can substitute the final exam for up to 15% (the better of the two marks between final exam and coursework is considered). In case of a positive mark, project and coursework mark will count for all 3 regular exam sessions of the Academic Year (i.e., if the student fails or does not take the final exam, (s)he keeps the coursework and/or project mark and only retakes the final exam).

Required readings	• Foundations of Databases: S. Abiteboul, R. Hull, and V. Vianu, Addison Wesley, 1995 (available online) • The Description Logic Handbook: Theory, Implementation and Applications (2nd edition). Cambridge University Press, 2007. ISBN 9780521150118. Edited by F. Baader, D. Calvanese, D. McGuinness, D. Nardi, P. F. Patel-Schneider. • Ontologies and databases: The DL-Lite approach. Diego Calvanese, G. De Giacomo, D. Lembo, M. Lenzerini, A. Poggi, M. Rodriguez-Muro, and R. Rosati. In Semantic Technologies for Informations Systems - 5th Int. Reasoning Web Summer School (RW 2009), volume 5689 of Lecture Notes in Computer Science,

	pages 255-356. Springer, 2009. Available at http://www.inf.unibz.it/~calvanese/papers-html/RW-2009.html
Supplementary readings	Lecture notes and additional reading material covering the course topics will be provided during the course and made available in the course web page.