COURSE DESCRIPTION – ACADEMIC YEAR 2018/2019

Course title	**Organizational Modelling**
Course code	73012
Scientific sector	ING-INF/05
Degree	Master in Computational Data Science (LM-18)
Semester	1
Year	1
Credits	12
Modular	Yes

Total lecturing hours	80
Total lab hours	40
Attendance	Not compulsory for Module 1 and Mandatory for Module 2
Prerequisites	None.
Course page	https://ole.unibz.it/

Specific educational objectives	The course belongs to the type "caratterizzanti – discipline informatiche" in the curriculum "Data Management". The main goal of the course is to study and put into practice languages, methodologies, and techniques for the conceptual modeling of data and processes, towards the realization of correct, effective information systems for organizational support. In this light, the course aims at providing professional skills and knowledge. The first module focuses on conceptual modelling languages, and consists of two main parts. The firs part focuses on data modeling, with emphasis on fact- oriented approaches so as to capture relevant facts, entities, relations, and constraints by starting from facts of interest.The second part targets process modeling, so as to tackle the (business) processes that regulate the way organizations regulate their internal work and discipline the interaction with external stakeholders, towards the achievement of their strategic objectives. The second module provides principles and methods to support the modeler in the creation of conceptual models that suitably reflect the relevant aspects of an organization. This is done in two parts. The first part focuses on the relation between information systems and the entities, events (processes, changes, states) and types in reality that they are supposed to represent. This part also investigates the role of Ontology (as a study of this underlying reality) for the design, assessment and management of information systems. In particular, for a systematic design process that favors information systems interoperability. In the second part, we study how these conceptual models of reality influence the design of information systems as computational artifacts. Furthermore, we investigate a number of important Design Patterns and Anti-Patterns and show how they facilitate the process of model-driven information systems engineering.

Module 1	**Data and Process Modelling**
Module code	73012A
Module scientific sector	ING-INF/05
Lecturer	Marco Montali
Contact	Piazza Domenicani 3, Room 2.01, montali@inf.unibz.it, 0471-016116
Scientific sector of lecturer	ING-INF/05
Teaching language	English
Office hours	Check the home page of the lecturer.
Lecturing assistant (if any)	-
Contact LA	-
Office hours LA	-
Credits	6
Lecturing hours	40
Lab hours	20
List of topics	• Conceptual modelling for information systems • Data modelling: languages, techniques, methods • From data models to information systems • Process modelling: languages, techniques, methods • Process analysis and simulation • Linking data and processes
Teaching format	Frontal lectures, exercises, labs, project.

Module 2	**Information Systems Design**
Module code	73012B
Module scientific sector	INF/01
Lecturer	Giancarlo Guizzardi
Contact	Office 3.06, gguizzardi@unibz.it, 3662896895
Scientific sector of lecturer	INF/01
Teaching language	English
Office hours	To be arranged beforehand by email.
Lecturing assistant (if any)	-
Contact LA	-
Office hours LA	-
Credits	6
Lecturing hours	40
Lab hours	20
List of topics	• Design of complex static object structures and role-based modelling • Design of complex relational properties • Design of complex enterprise events • Verification and validation of models • Patterns and anti-patterns • Model-based code generation and mapping to different implementation platforms
Teaching format	Frontal lectures, modeling exercises, projects in groups.

Learning outcomes	Knowledge and understanding: • D1.2 - Understanding of the skills, tools and techniques required for an effective use of data science • D1.5 - Knowledge of principles and models for the representation, management and processing of complex and heterogeneous data

	• D1.10 - Knowledge of languages, methodologies and architectures for modelling data, processes and organisations Applying knowledge and understanding: • D2.1 - Practical application and evaluation of tools and techniques in the field of data science • D2.10 - Application of languages, tools, and methods for the design of information systems and their corresponding software applications for data, process, and organization management Making judgments • D3.2 - Ability to autonomously select the documentation (in the form of books, web, magazines, etc.) needed to keep up to date in a given sector Communication skills • D4.1 - Ability to use English at an advanced level with particular reference to disciplinary terminology • D4.2 - Ability to present one's work in a clear and comprehensible way in front of an audience, including non-specialists • D4.3 - Ability to structure and draft scientific and technical documentation • D4.5 - Ability to interact and collaborate in the implementation of a project or research with peers and experts Learning skills • D5.1 - Ability to autonomously extend the knowledge acquired during the study course. • D5.3 - Ability to deal with problems in a systematic and creative way and to appropriate problem solving techniques.

Assessment	**Module 1:** The assessment of the first module consists of a written exam, with exercises and (verification and transfer of knowledge) questions on all the topics covered by the course. **Module 2:** The assessment of the second module consists of two parts: • A project assignment: for the project assignment, a written project report including the produced models must be handed in on the pre-announced date and time. • An oral exam with verification and comprehension questions.
Assessment language	English
Assessment Typology	Monocratic
Evaluation criteria and criteria for awarding marks	**Module 1:** The written exam is evaluated by considering correctness, clarity and rationale of the provided answers. **Module 2:** 70% collective project assignment, 30% individual oral exam; ALL parts must be positive! • Oral exam: creativity, skills in critical thinking; ability to summarize in own words and concisely present (intermediate and final) results;

	clarity of answers, mastery of language, ability to clearly explain, summarize, evaluate, and establish relationships between topics; demonstrate a deep understanding of the subjects covered during the course and be able to describe them precisely and clearly. • Relevant for collective project assignment: ability to work in a team, creativity, introduce oneself into new topics and research literature on your own to create a deep understanding; demonstrate a deep understanding of the subjects covered during the course and be able to describe them precisely and clearly. The overall, final mark is computed as the average of the marks obtained in the two modules.

Required readings	• Halpin, T. and Morgan, T.: Information Modeling and Relational Databases. Morgan Kaufmann, 2008. • Halpin, T.: Object-Role Modeling Fundamentals: A Practical Guide to Data Modeling with ORM. Technics Publications, 2015. Business process modelling • Guizzardi, G., Ontological Foundations for Structural Conceptual Models, Universal Press, 2005. • Dumas, M., La Rosa, M., Mendling, J. and Reijers, H. A.: Fundamentals of Business Process Management. Springer, 2013. • Silver, B.: BPMN: Method and Style. (2nd edition). Cody-Cassidy Press, 2011. Subject Librarian: David Gebhardi, David.Gebhardi@unibz.it
Supplementary readings	• Olivé, A.: Conceptual Modeling of Information Systems. Springer, 2007. • Weske, M.: Business Process Management: Concepts, Languages, Architectures. Springer, 2007. • Snoeck, M., Enterprise Information Systems Engineering : The MERODE Approach, The Enterprise Engineering Series, Springer-Verlag.
Software used	• Data modeling with ORM: NORMA for Visual Studio. • Data modeling with UML. • Business process modeling with BPMN: Oryx Signavio. • Object-relational mapping: Java SDK and JBoss Hibernate. • Advanced Conceptual Modeling Tools. An example is the Menthor Tool for Conceptual Modeling (http://www.menthor.net)