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

# COURSE DESCRIPTION – ACADEMIC YEAR 2022/23

| Course title | **Data and Process Modelling** |
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| Course code | 73046 |
| Scientific sector | ING-INF/05 |
| Degree | Master in Computational Data Science (LM-18) |
| Semester | 2 |
| Year | 1 |
| Credits | 6 |
| Modular | No |

| Total lecturing hours | 40 |
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| Total lab hours | 20 |
| Attendance | Not compulsory |
| Prerequisites | |
| Course page | https://ole.unibz.it/ |

| Specific educational objectives | The course belongs to the type "caratterizzanti – discipline informatiche" in the curriculum "Data Management". |
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| | The main goal of the course is to study and put into practice languages, methodologies, and techniques for the conceptual modelling of data and processes, towards the realization of correct, effective information systems for organisational support. In this light, the course aims at providing professional skills and knowledge. |
| | This is achieved by studying conceptual modelling languages and their formal counterparts, operating in three phases. In the first phase, the focus is on structural data modelling, with emphasis on fact- oriented approaches to capture relevant facts, entities, relations, and constraints by starting from facts of interest. ORM is used as an exemplar language, paired with a well-defined methodology, to elicit and document structural conceptual models. |
| | The second phase targets process modelling, to tackle the work processes that regulate the way organisations regulate their internal work and discipline the interaction with external stakeholders, towards the achievement of their strategic objectives. Petri nets are mainly employed here as a foundational approach to capture dynamic systems, linking them to front-end process modelling languages such as BPMN. |
| | The last phase consists in discussing how these two different dimensions can be merged, obtaining combines models that indicate how processes operate over data objects and their relations, and that fully capture information systems and their dynamics. |

| Lecturer | Marco Montali (https://www.inf.unibz.it/~montali) |
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| 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 homepage of the lecturer. |

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| **Lecturing assistant (if any)** | - |
| **Contact LA** | - |
| **Office hours LA** | - |
| **List of topics** | • Introduction to business process management<br>• Data modeling<br>• Process modeling<br>• Linking data and processes<br>• Model-driven analysis<br>• Data-driven analysis and process mining |
| **Teaching format** | Frontal lectures, exercises, labs. |

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| **Learning outcomes** | Knowledge and understanding:<br>• D1.2 - Understanding of the skills, tools and techniques required for an effective use of data science<br>• D1.5 - Knowledge of principles and models for the representation, management and processing of complex and heterogeneous data<br>• D1.10 - Knowledge of languages, methodologies and architectures for modelling data, processes and organisations<br>Applying knowledge and understanding:<br>• D2.1 - Practical application and evaluation of tools and techniques in the field of data science<br>• 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<br>Making judgments<br>• 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<br>Communication skills<br>• D4.1 - Ability to use English at an advanced level with particular reference to disciplinary terminology<br>• D4.2 - Ability to present one's work in a clear and comprehensible way in front of an audience, including non-specialists<br>• D4.3 - Ability to structure and draft scientific and technical documentation<br>• D4.5 - Ability to interact and collaborate in the implementation of a project or research with peers and experts<br>Learning skills<br>• D5.1 - Ability to autonomously extend the knowledge acquired during the study course.<br>• D5.3 - Ability to deal with problems in a systematic and creative way and to appropriate problem solving techniques. |

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| **Assessment** | Written exam, with exercises and (verification and transfer of knowledge) questions on all the topics covered by the course. |
| **Assessment language** | English |

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| Assessment Typology | Monocratic |
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| **Evaluation criteria and criteria for awarding marks** | The written exam is evaluated by considering correctness, clarity and rationale of the provided answers. |

| Required readings | • Halpin, T. and Morgan, T.: Information Modeling and Relational Databases. Morgan Kaufmann, 2008.<br>• Dumas, M., La Rosa, M., Mendling, J. and Reijers, H. A.: Fundamentals of Business Process Management. Springer, 2013.<br>• Matthias Kunze, Mathias Weske: Behavioural Models - From Modelling Finite Automata to Analysing Business Processes. Springer 2016, ISBN 978-3-319-44958-6, pp. 3-272<br><br>Subject Librarian: David Gebhardi, David.Gebhardi@unibz.it |
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| **Supplementary readings** | • Halpin, T.: Object-Role Modeling Fundamentals: A Practical Guide to Data Modeling with ORM. Technics Publications, 2015.<br>• Wolfgang Reisig: Understanding Petri Nets - Modeling Techniques, Analysis Methods, Case Studies. Springer 2013, ISBN 978-3-642-33277-7, pp. I-XXVI, 1-230.<br>• Kurt Jensen, Lars Michael Kristensen: Coloured Petri Nets - Modelling and Validation of Concurrent Systems. Springer 2009, ISBN 978-3-642-00283-0, pp. I-XI, 1-384. |
| **Software used** | • Data modelling with ORM: NORMA for Visual Studio.<br>• Various tools for modelling Petri nets.<br>• ISML for integrating Petri nets and ORM. |