COURSE DESCRIPTION – ACADEMIC YEAR 2021/2022

Course title	**Mathematics and Statistics for Data Science**
Course code	73065
Scientific sector	MAT/06
Degree	Master in Computational Data Science (LM-18)
Semester	1
Year	1
Credits	6
Modular	No

Total lecturing hours	40
Total lab hours	20
Attendance	Generally, attendance is not compulsory, but non-attending students have to contact the lecturer at the start of the course to agree on the modalities of the independent study.
Prerequisites	
Course page	https://ole.unibz.it/

Specific educational objectives	The course belongs to the type "affini o integrative – formazione affine". The course consists of two parts. The first part introduces the concepts and mathematical tools of linear algebra and mathematical analysis necessary to understand the concepts and solve the problems of probability and statistics. In the second part the course will cover the basic topics of probability and statistics that are preparatory to the advanced course and that are used in various other courses of the university course in computer science. At the end of the course, the student will have acquired the basics of mathematical calculus, probability and statistics that will allow him/her to solve the most common problems of statistical data processing and interpretation that are common to many scientific fields such as computer science and software engineering, artificial intelligence and data processing in numerous applications of these fields (e.g., biology, medicine and social sciences).

Lecturer	Paola Lecca
Contact	Piazza Domenicani 3, Room 3.11, Paola.Lecca@unibz.it, +39 0471 016162
Scientific sector of lecturer	INF/01
Teaching language	English
Office hours	Tuesday 9:30 – 10:30, arrange by email.
Lecturing Assistant (if any)	--
Contact LA	--
Office hours LA	--
List of topics	• Fundamentals of differential and integral calculus • Fundamentals of linear algebra • Probability theory • Data distribution models and analysis • Hypothesis tests

	• Regression analysis
Teaching format	Frontal lectures and exercices.

Learning outcomes	Knowledge and understanding: • D1.1 - Knowledge of the key concepts and technologies of data science disciplines • D1.8 - Knowledge of the mathematical-statistical principles required for data analysis Applying knowledge and understanding: • D2.1 - Practical application and evaluation of tools and techniques in the field of data science • D2.2 - Ability to address and solve a problem using scientific methods • D2.7 - Practical application of mathematical-statistical tools and methods from the field of data science 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 Learning skills • D5.3 - Ability to deal with problems in a systematic and creative way and to appropriate problem solving techniques.

Assessment	Written exam with verification theory questions and exercises on the 100% of the program. This modality holds both for attending and non-attending students.
Assessment language	English
Assessment Typology	Monocratic
Evaluation criteria and criteria for awarding marks	Final pass mark. The minimal threshold to pass the exam is 18/30. These evaluation criteria hold both for attending and non-attending students

Required readings	The course includes topics from different disciplinary areas of mathematics that are unlikely to be contained in a single textbook. It is therefore advisable that the student follows the notes that the lecturer will make available at each lecture and laboratory. However, there are textbooks that the student can refer to for the various parts and topics of the course, for example: for the part I of the course: • Howie, John M., Real Analysis, Springer, 2001

	• James, E. Gentle, Matrix Algebra: Theory, Computations and Applications in Statistics (Springer Texts in Statistics) 2nd ed. 2017 for the part II of the course: • Frederik Michel Dekking, Cornelis Kraaikamp, Hendrik Paul Lopuhaä, Ludolf Erwin Meester, A Modern Introduction to Probability and Statistics, Understanding Why and How, Springer 2005. Subject Librarian: David Gebhardi, David.Gebhardi@unibz.it
Supplementary readings	Suggested by the lecturer during the course if needed.
Software used	The course does not include programming labs. However, example scripts in R (www.r-project.org) will be shown. Communicate needed software and technical requirements in advance to cs-tech@inf.unibz.it