Course unit English denomination	Programming Methodologies for Data Analysis
SS	INF-05/A
Teacher in charge (if defined)	• Luca Di Gaspero • Francesca Da Ros
Teaching Hours	30
Number of ECTS credits allocated	5
Course period	11/2026-01/2027
Course delivery method	☒ In presence ☐ Remotely ☐ Blended
Language of instruction	English
Mandatory attendance	☒ Yes (100% minimum of presence, apart from exceptional absences that must be justify in advance) ☐ No
Course unit contents	The course will be split in a set of conceptual lectures (18h) and a set of guided practice (12h). The detailed topics that will be covered by the course include: - Basic data types, control flow, structured data types (tuples, sets, lists, dictionaries, strings), functions; - Comprehensions and generators; - Functional programming style and higher-order functions (map, filter, reduce); - Input/Output (file manipulation, network access), Exceptions, modules and packages; - Data representation and manipulation libraries (numpy, pandas, json, xml); - Web scraping (playwright); - Data visualization (seaborn/plotly) and dashboards (streamlit/dash); - BigData Platforms (pySpark); - Neural Networks Libraries (PyTorch); - Natural Language Processing (HuggingFace); - HyperParameter tuning (Optuna).
Learning goals	The course aims at providing a comprehensive working knowledge of different computer programming styles using the Python language. After introducing language basics, the course will cover specifically functional programming in Python, which is the fundamental tool of several data- processing libraries and frameworks. Moreover, a few relevant modules from the Python standard library will be introduced, with a particular focus at the data-analysis and machine learning ecosystem. Also, we will cover best practices to use programming for executing frequent tasks and will investigate how to use Python in different scenarios, from small scripting tasks to medium-scale projects.
Teaching methods	• Lectures • Laboratories

Course on transversal, interdisciplinary, transdisciplinary skills	☒ Yes ☐ No
Available for PhD students from other courses	☒ Yes ☐ No Students from other PhD courses may be admitted subject to CV evaluation by the Faculty Board
Prerequisites (not mandatory)	Basic programming skills are beneficial but not mandatory for this course.
Examination methods (if applicable)	The assessment will consist of weekly homework assignments and a final written exam. The homework assignments will allow students to apply the concepts learned in class on a regular basis, reinforcing their understanding. The final exam will focus on demonstrating mastery in data processing and wrangling using the tools and techniques covered throughout the course.
Suggested readings	• Course material available from the instructors
Additional information	max 3750 caratteri