

## **Programming 3**

- 1. Course number and name:** 020IF3NI4/020PR3NI4 Programming 3
- 2. Credits and contact hours:** 4 ECTS credits, 2x1:15 contact hours
- 3. Name of course coordinator:** Rita Azzi
- 4. Instructional materials:** course handouts; lab experiments; slides; in-class problems

**5. Specific course information**

**a. Catalog description:**

This course covers advanced programming concepts in Python. It includes a systematic study of existing sorting algorithms and how to calculate their time complexity. The course explores applying recursion to sorting algorithms with a recursive structure. It also covers file management for saving or reading structured or unstructured data, creating and manipulating relational databases, building command-line interfaces, using specialized libraries for scientific computing and data analysis, and connecting to remote sites to retrieve or submit data through programming interfaces (APIs).

**b. Prerequisites:** 020IF1NI2/020PR1NI2 Programming 1

**c. Required/Selected Elective/Open Elective:** Required

**6. Educational objectives for the course**

**a. Specific outcomes of instruction:**

- Analyze algorithm complexity and calculate time complexity effectively.
- Apply recursion to algorithms, particularly those with recursive structures.
- Master quadratic sorting algorithms, including Bubble Sort, Selection Sort, and Insertion Sort.
- Implement and apply linearithmic sorting algorithms, such as Merge Sort and Quick Sort.
- Manage text and binary files proficiently for saving and reading structured or unstructured data.
- Develop command-line interfaces for efficient program interaction.
- Implement and conduct unit tests to ensure code reliability.
- Create and manipulate relational databases using acquired skills.
- Perform numerical computations using the "numpy" library for scientific applications.
- Utilize programming interfaces to connect to remote sites and interact with data through APIs.

**b. PI addressed by the course:**

<b>PI</b>	1.2	1.3	6.3	6.4
<b>Covered</b>	x	x	x	x
<b>Assessed</b>	x	x	x	x

**7. Brief list of topics to be covered**

- Algorithm Complexity (2 lectures)
- Recursion (4 lectures)
- Quadratic Sorting Algorithms (Bubble Sort, Selection Sort, Insertion Sort) (4 lectures)
- Linearithmic Sorting Algorithms (Merge Sort, Quick Sort) (3 lectures)
- File Management (Text and Binary) (2 lectures)
- Command-Line Interfaces (1 lecture)
- Unit Testing (1 lecture)
- Relational Databases (2 lectures)
- Numerical Computations with the "numpy" library (3 lectures)
- Programming Interface (2 lectures)