Programming 3

- 1. Course number and name: 020IF3NI4 Programming 3
- 2. Credits and contact hours: 4 ECTS credits, 2x1:15 contact hours
- **3.** Name(s) of instructor(s) or course coordinator(s): Chantal Saad Hajjar, Tina Yaacoub, Ibtissam Constantin
- 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 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:

PI	1.2	1.3	6.3	6.4
Covered	Х	Х	Х	Х
Assessed	Х	Х	Х	Х

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)