

**Course offered for the PhD program  
in Civil, Chemical and Environmental Engineering  
a.y. 2023/2024 (XXXIX cycle)**

(course is open for participation of students from other PhD cycles or programs)

**1. Title**

Python for Environmental Sciences and Engineering

**2. Course Description**

This course is designed to introduce the student to the Python foundations along with content relevant to scientists and engineers interested in using Python for their day-to-day computational tasks. It is a highly interactive training where the student will learn the essentials of the Python language and of the foundational packages of Python's scientific ecosystem. The course starts with a brief overview of the Scientific Python ecosystem, and then different sessions are set to learn about the techniques for numeric data processing, including efficiently manipulating and processing large data sets using NumPy arrays and data visualization with 2D plots using Matplotlib. An introduction to the scientific library Scipy is given along with practical examples. Then, the course will have a session to introduce Pandas to efficiently load, clean, normalize, aggregate, transform, and visualize data. The course will end with a dedicated session to solve problems of interest proposed by the students.

**3. Course Organization**

The course consists of lectures and computer-based tutorials. A hybrid modality will be offered (virtual and in-presence participation) although in-presence participation of at least 75% of the hours is required for students that wish to obtain the credits.

**4. Teacher**

Andrea Lira Loarca - andrea.lira.loarca@unige.it

**5. Duration and credits**

18 hours

Introduction to python, editors, and scientific libraries (2 hours)

Basics of python programming (2 hours)

Numpy (with examples) (2 hours)

Matplotlib (with examples) (2 hours)

Scipy (with examples) (2 hours)

Pandas (with examples) (2 hours)

Overview of advanced libraries (2 hours)

Exercises proposed by students. (4 hours)

**6. Activation mode and teaching period**

A hybrid modality will be offered (virtual and in-presence participation) although in-presence participation of at least 80% of the hours is required for students that wish to obtain the credits.

The course will be taught from the end of January until mid-March 2024.

## **7. Deadline for registration**

January 2024

## **8. Final exam**

To obtain the credits, students will have to deliver a Python project relating their research in Environmental Science developed using the tools taught throughout the course.