

École doctorale de Physique en Île de France

ED564 : PSL - SU - UP - UPSaclay

<https://www.edpif.org>

Cours de « Python pour la physique »

Pierre Cladé (LKB)

This course will be taught in English in case of non-French speaking students.

The registration can be done independently for the 4 sessions.

Capacity limited to 24 places

The last session is dedicated to experimentalists.

Session 1 : Introduction to Python programming language (6h)

Participants will be introduced to the Python programming language. General good programming practices will be emphasized.

Prerequisites: Participants **must be** familiar with a programming language.

Date: 2020, nov 16th 9:30-12:30+13:30-16:30 **Location:** Room 361, Ecole Normale Supérieure, 24 rue Lhomond 75005 Paris

Outline:

- Installation of Python
- Variables
- Numeric and non-numeric types
- Container types: lists, tuples, sets, dictionaries,...
- Mathematical functions
- Definition of functions and documentation
- Files
- Character encodings
- Introduction to object-oriented programming: attributes and methods
- How to use modules and packages

Session 2: Simulation and data analysis using Python (6h)

Python is well adapted both for simulation and data analysis. We will introduce three libraries used to perform scientific calculations (numpy, scipy and matplotlib).

Date: 2020 nov 23th: 9:30-12:30+13:30-16:30 **Location:** Room 361, Ecole Normale Supérieure, 24 rue Lhomond 75005 Paris

Prerequisites: *Python basics (cf session 1)*

Outline : The aim of this formation is to learn:

- how to use data array to perform efficiently numerical calculation,

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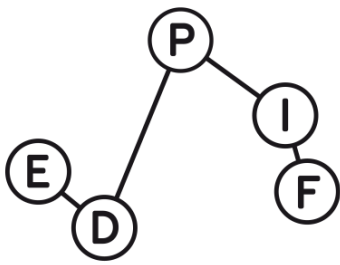
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- how to plot curves,
- how to fit data,
- how to use some algorithms that are already implemented (Fourier transform, ordinary differential equations ...)

Session 3 : Object-oriented programming in Python (6h)

Python is a general-purpose high level language. We believe that using feature such as object-oriented programming is essential for programming in science. It is the purpose of this session.

Date: 2020 nov 30th: 9:30-12:30+13:30-16:30 **Location:** Room 361, Ecole Normale Supérieure, 24 rue Lhomond 75005 Paris

Prerequisites: *Python basics (cf session 1&2)*

Outline :

How to create your own class
Class inheritance
Special methods
Emulating container and numeric types
Properties and descriptor
Object-oriented programming and database

Session 4: Introduction to experiment control in Python (6h)

Date: 2020 dec 7th 9:30-12:30+13:30-16:30 **Location:** Room 361, Ecole Normale Supérieure, 24 rue Lhomond 75005 Paris

Prerequisites: *Good skills in Python*

Outline :

The course will consist of two parts:

- *Interfacing scientific devices under Python (3h)*. We will discuss the most common problems encountered when writing a program controlling an experiment and how to solve them in Python. As an exercise, we will write a module to communicate with an oscilloscope.
- *Realization of a graphical interface with PyQT (3h)*. After a brief introduction to PyQT, we will create a graphical interface to control the oscilloscope and visualize its data. We will also discuss data storage under Python.

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