

École doctorale de Physique en Île de France

ED564 : PSL – SU – USPC – UPSaclay

<https://www.edpif.org>

Cours de « Python pour la physique »

Pierre Cladé (LKB) et Jérôme Estève (LPS Orsay)

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

The registration can be done independently for the 4 sessions.

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: 2018 Nov 15th: 9:30-12:30+13:30-16:30 **Location:** Jussieu, Atrium. Room micro 119 and 102

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: 2018 Nov 22th: 9:30-12:30+13:30-16:30 **Location:** Jussieu, Atrium. Room micro 119

Prerequisites: *Python basics (cf session 1)*

Outline: The aim of this formation is to learn:

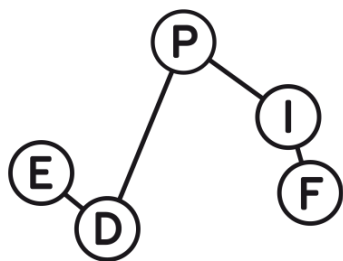
- how to use data array to perform efficiently numerical calculation,
- how to plot curves,
- how to fit data,

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- 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: 2018 Nov 29th: 9:30-12:30+13:30-16:30 **Location:** Jussieu, Atrium. Room micro 119 and 102

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: 2018 Dec 6th: 9:30-12:30+13:30-16:30 **Location:** Jussieu, Room 22-23.111

Prerequisites: *Good skills in Python*

Outline:

- *Interfacing scientific instruments with Python (3h)*
After a brief introduction to instrument control and communication, we will see how these tasks can be handled with Python. As an exercise, we will write a module to control and fetch data from an oscilloscope.
- *Creating a graphical user interface with PyQt (3h)*
We will shortly describe the PyQt framework, which is widely used to create GUI in Python. Following up the morning session, we will create a GUI to control the oscilloscope. We will also discuss the issue of data storage and how it can be done with Python.

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