

# UE Scientific programming in Python



ECTS  
3 crédits



Crédits ECTS  
Echange  
3.0



Composante  
UFR Physique,  
Ingénierie,  
Terre,  
Environnement,  
Mécanique  
(PhITEM)



Période de  
l'année  
Automne (sept.  
à dec./janv.)

## Diplômes intégrant cet élément

- Master Electronique, énergie électrique, automatique

- › **Langue(s) d'enseignement:** Anglais
- › **Ouvert aux étudiants en échange:** Oui
- › **Crédits ECTS Echange:** 3.0
- › **Code d'export Apogée:** PAX7ECAL

## Présentation

### Description

Using a scientific programming language (e.g., Python) as a tool for modelling and numerical analysis.

### Objectifs

#### Outline:

1. Number representation systems and their precision
2. Data in Python
  1. Basic data structures: scalars, strings, lists, dictionaries, sets, tuples
  2. Matrix representations of numbers: the numpy ndarray (vs matrix), pandas data tables

3. Read and write data according to the data type (CSV, JSON, pickle, . . . )
3. Array operations:
  1. Unitary operators  $MX_0 \rightarrow MX_1$
  2. N-ary operators ( $MX_0, \dots, MX_{n-1} \rightarrow MX_n$ )
4. Solving equations
  1. Linear matrix equations with applications to interpolation and regression
  2. Differential equations with applications to interpolation and prediction
5. Probability and statistics in Python
  1. Probability laws: distribution families, random variables, realisations
  2. Statistical tests

## Heures d'enseignement

|      |                                   |     |
|------|-----------------------------------|-----|
| CMTD | Cours magistral - Travaux dirigés | 14h |
| TP   | TP                                | 16h |

## Pré-requis recommandés

Mathematical background on probability and statistics, linear algebra and differential equations

## Syllabus

- a. <https://www.scipy.org/>
- b. Bashier, E.B.M. (2020). Practical Numerical and Scientific Computing with MATLAB and Python (1st ed.). CRC Press.
- c. H. P. Langtangen, A Primer on Scientific Programming with Python. Springer Berlin Heidelberg, 2016

**Période :** Semestre 7

## Infos pratiques

### Campus

- Chambéry - Domaine universitaire
- Grenoble - Polygone scientifique
- Grenoble - Saint-Martin d'Hères