Master's Department of Engineering Sciences

Name of the unit: Object-oriented programming in Python

Lecturer: Louis Annabi (annabi@isir.upmc.fr)
Course code: UM4RBT10-Python
Student workload: 8h of lectures, 6h of tutorial sessions, 12h of lab sessions@
Credits: 3 ECTS

Specialization tracks:	- **E3A** :	☐ CIMES	☒ Syscom	☐ IPS
	- **AR** :	☒ ROBOT	☒ SI	☒ MeDH
	- **MECA** :	☐ MS2	☐ MF2A	☐ CompMech
		☐ ACOU	☐ EE	☐ EE APP

Semester offered: ☒ S1 ☐ S2 ☐ S3 ☐ S4
Language of instruction: ☒ French ☐ English
Targeted audience: ☒ Engineering Sciences students ☐ Other (specify):
Localization : ☒ PMC Campus ☐ Other (specify):

Course Overview

This course aims to train students in object-oriented programming, based on the Python language. After reminders on Python syntax, the teaching focuses on the presentation and practice of OOP concepts (classes, objects, encapsulation, relationships, inheritance, abstraction).
Keywords: Object-oriented programming, Python, classes, objects, encapsulation, relationships, inheritance, abstraction

Prerequisites

Students should have previously acquired the following prerequisites to follow this course:

- Write a program using variables, operators, control structures (if/else) and loops (for/while)
- Write a program that defines and manipulates lists and functions
- Call a function in an existing package from provided documentation
- Prepare a working environment for programming (interpreter, IDE, launch a script)

Intended Learning Outcomes

By the end of this course, students will be able to:

1. Test your functions and classes with different test scenarios described and performed in a notebook
2. Use a virtual environment and version control software (git)
3. Document a function or class using docstrings
4. Find and use the right function or class for your needs within a package
5. Moving from a statement that shows classes and attributes to a UML class diagram
6. Moving from a simple UML diagram (a single class) to the corresponding program, and vice versa
7. Moving from a complex UML diagram (several classes, relationships, inheritance, abstraction) to the corresponding program, and vice versa
8. Moving from a "non-object" code to an "object" code by grouping data and processing

Indicative Teaching Sequence and Methods

Week	C/TD/TP*	Content	Preparation	Learn. outc.
S5	C1	Work environment (git, venv). Testing and Documentation		AAV1, AAV2, AAV3
S6	TP1	Practical work on the C1 course + python reminders	Review the fundamentals of python (resources will be made available)	AAV1, AAV2, AAV3
S7	C2	Classes and Items. List and str methods		AAV5, AAV6, AAV8
S8	TD1 + TP2	Tutorials and practical work on the C2 course		AAV3, AAV5, AAV6, AAV8
S9	C3 + TP3	Encapsulation and magic methods. Graded practical work for courses C1/C2		AAV3, AAV5, AAV6, AAV8
S10	TD2 + TP4	Tutorials and practical work on the C3 course		AAV3, AAV5, AAV6, AAV8
S11	C4	Relationship between classes. Inheritance and abstraction		AAV5, AAV6, AAV7, AAV8
S12	TD3 + TP5	Tutorials and practical work on the C4 course + use of scientific packages (numpy, matplotlib)		AAV3, AAV4, AAV5, AAV6, AAV7, AAV8
S14	TP6	Project defense lab		AAV1, AAV2, AAV3, AAV4, AAV5, AAV6, AAV7, AAV8

* C/TD/TP respectively corresponds to lectures, tutorials and lab sessions.

Sequence of the unit:
The UE takes place in 2 successive sequences:
- Sequence 1: implementation of good practices (environment, tests, doc) and basics of OOP (C1/2 + TD1 + TP1/2 + TP3 graded)
- Sequence 2: more advanced notions of OOP (encapsulation, relationships, inheritance and abstraction) (C3/4 + TD2/3 + TP 4/5 + TP6 defense)

Indicative Assessment of Intended Learning Outcomes (1st session)

Week	Individ./group	In-person/remote	Type of exam	Evaluated outcomes	Scale %
S9	Individual	In-person	Practical	3, 5, 6, 8	20 %
S14	Individual	In-person	Other	1, 2, 3, 4, 5, 6, 7, 8	40 %
S15	Individual	In-person	Written	5, 6, 7, 8	40 %

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Session	Individ./group	In-person/remote	Type of exam	Evaluated outcomes	Scale %
2	Individual	In-person	Written	5, 6, 7, 8	40 %
1	Individual	In-person	Practical	3, 5, 6, 8	20 %
1	Individual	In-person	Other	1, 2, 3, 4, 5, 6, 7, 8	40 %

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