UCLouvain

lphys1201

2023

Computer Science and Numerical Methods

6.00 credits	30.0 h + 45.0 h	Q1

Teacher(s)	Bruno Giacomo ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	None
Main themes	Computer science: computers, data communication and programming. Numerical methods and their applications.
Learning outcomes	**At the end of this learning unit, the student is able to :** **a. Contribution of the teaching unit to the program objectives** AA1 : 1.1, 1.5, 1.7 AA2 : 2.3, 2.4 AA3 : 3.2 **b. Specific learning outcomes of the teaching unit** At the end of this teaching unit, the student will be able to : 1 1. use a computer and data communication networks with an understanding of how these tools work; 2. master an object-oriented programming language and develop software solutions for various types of requests; 3. apply the most common numerical methods to perform scientific calculations; 4. analyze a complex scientific problem and imagine a solution using numerical methods and computer programming; 5. Summarize his/her approach and results in the context of the previous point in a written report.
Evaluation methods	* Compulsory continuous evaluation during the practice sessions (8 tests) for a total of 4 points out of 20. Two absences will be tolerated, beyond which it will be considered that the student has not participated sufficiently in the evaluation and points will be lost. * Project in small groups based on programming and numerical calculation methods, subject to a report and an oral presentation during the exam session, for a total of 8 points out of 20. * Exam written during the exam session covering numerical calculation methods, worth 4 points out of 20, and the architecture of computers and networks, worth 4 points out of 20. In order to suceed the exam, a minimum of 7 points out of 20 is required for each of the four evaluated parts: 1) continuous evaluation, 2) project, 3) numerical calculation methods, 4) architecture of computers and networks.
Teaching methods	In-depth explanations during the lectures of the content of the teaching unit. Programming exercises in the computing laboratory using the most common numerical methods. Application to physics systems and problems.
Content	History of computing. Architecture and operation of computers. Network communication. An object-oriented programming language. Matrix diagonalization techniques for solving systems of equations. Interpolation / adjustment / extrapolation methods. Digital integration methods. Monte Carlo method and its applications. Application of the above methods to physics systems and problems in the computing laboratory. Projects to be carried out alone or in small groups.
Inline resources	https://docs.python.org/3.6/

Bibliography	https://docs.python.org/3.6/ W. Stallings, "Computer Organization and Architecture", ed. Pearson. W. Stallings, "Data and Computer Communications", ed. Pearson. A. L. Garcia, "Numerical methods for Physics", ed. Prentice Hall. W. H. Press and others, "Numerical Recipes", ed. Cambridge University Press. J. Kiusalaas, "Numerical Methods in Engineering with Python 3", ed. Cambridge University Press. Diapositives et syllabus mis à disposition sur le site moodle du cours.
Faculty or entity in charge	PHYS

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Bachelor in Physics	PHYS1BA	6		🔍