







5.00 credits

30.0 h + 30.0 h

Q1

Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	This course assumes that you have acquired the basic notions of programming (instructions, variables, loops, conditions, etc.) as taught in the LEPL1401 or LINFO1101 course. <i>The prerequisite(s) for this Teaching Unit (Unité d'enseignement – UE) for the programmes/courses that offer this Teaching Unit are specified at the end of this sheet.</i>
Main themes	<ul style="list-style-type: none"> - The Java language; - Abstract data types; - Linear and tree structures; - Recursive programming and algorithm; - Technique of reasoning on the accuracy of programs; - Notions of computational complexity of an algorithm; - Functional programming; - Modeling and object-oriented programming; - Parallel programming; - Program testing.
Learning outcomes	<p>At the end of this learning unit, the student is able to :</p> <p>With regard to the AA reference of the program "Bachelor in Engineering Sciences, orientation civil engineer", this course contributes to the development, acquisition and evaluation of learning outcomes.</p> <p>following:</p> <ul style="list-style-type: none"> - AA 1.1, 1.2 -AA 2.3, 2.4, 2.5, 2.6, 2.7 -AA 4.2, 4.3, 4.4 <p>More specifically, at the end of the course, the student will be able to:</p> <ul style="list-style-type: none"> - make a justified choice between several representations of information and several algorithms to process them, 1 - design (fragments of) programs in a functional style, - reasoning about (fragments of) programs: complexity of algorithms and efficiency of programs implementing them, recursive reasoning, - apply object-oriented modeling principles, - design and apply methods for testing a program, - design a simple parallel program <p>Students will have developed methodological and operational skills. In particular, they will have developed their ability to:</p> <ul style="list-style-type: none"> - Analyze a medium-sized problem, propose a computer solution to solve it and implement it in the Java language.
Evaluation methods	<p>An exam on INGINIOUS takes place at the end of the term and aims to not only verify knowledge of the material but also the ability to apply the acquired knowledge to write programs.</p> <p>An optional individual quiz is held halfway through the term, counting for a maximum of two points in the final course grade, and only if it benefits the student. The use of generative AI tools and any collaboration is strictly prohibited during this quiz.</p> <p>The final grade is calculated using the formula: $final_grade_out_of_20 = \max(quiz_out_of_2 + exam_out_of_18, exam_out_of_20)$.</p> <p>The points earned from the quiz will be carried forward for the August session.</p> <p>In case of suspected plagiarism (for example, detected using a plagiarism tool), the course instructors reserve the right to ask the student to take an oral examination on the quiz or the exam.</p>

Teaching methods	Instructors will introduce the content in a lecture setting during a traditional class, and it will be outlined in the syllabus titled "Programming Concepts in Java". For each topic covered, exercises are continuously available on the INGIInious platform, allowing the application of theoretical concepts. During the practical workshop sessions, assistants or tutors will be present to support and guide the students. Each student is fully responsible for their own learning. To succeed in the computer exam, it is essential for the student to practice regularly in Java using the IntelliJ tool.
Content	<p>This teaching unit focuses on:</p> <ul style="list-style-type: none"> - Introduction to Java: compilation, byte-code, virtual machine, primitive type, strings, tables - Abstract data types; - Linear and tree structures, and their applications; - recursive solution formulation and recursive algorithms; - reasoning technique: preconditions, postconditions, invariants - Notions of computational complexity and analysis of the temporal and spatial complexity of an algorithm; - Functional programming and higher order programming - Object-oriented modeling (inheritance, composition, reuse, polymorphism, class invariant); - Introduction to design patterns; - Program testing and validation methods; - Introduction to parallelization: notion of thread and synchronization mechanisms. <p>Students who have successfully completed this course will be able to</p> <ul style="list-style-type: none"> • to design Java programs • analyze programs according to their performance • to prove correctness of programs using invariants • apply the principles of object-oriented programming such as genericity, abstraction, composition and reuse • design and implement variants of the algorithms studied in high quality Java programs. • design and manipulate simple linear and tree and recursive structures • design tests for programs • design functional programming approaches to solve small algorithmic problems • use design patterns • design simple parallel programs with synchronization mechanisms
Inline resources	<p>https://lepl1402.readthedocs.io/ (links to the slides and other course contents).</p> <p>https://moodle.uclouvain.be/course/view.php?id=3831 Moodle et/ou Teams (communication with the students).</p> <p>https://inginius.info.ucl.ac.be/course/LEPL1402 for the exercises.</p>
Other infos	Background: LEPL1401 or a similar course
Faculty or entity in charge	BTCI

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Bachelor in Engineering	FSA1BA	5	LEPL1401	
Master [120] in Linguistics	LING2M	5		
Bachelor in Mathematics	MATH1BA	6	LINFO1101	
Bachelor in Computer Science	SINF1BA	5	LINFO1101	
Approfondissement en statistique et sciences des données	APPSTAT	5		
Minor in Computer Sciences	MINSINF	5		
Minor in Statistics, Actuarial Sciences and Data Sciences	MINSTAT	5		