# lsinc1111

*2023*

# Analysis

| 5.00 credits | 30.0 h + 30.0 h | Q1 |
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⊗ **This learning unit is not open to incoming exchange students!**

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| Teacher(s) | Nunes Grapiglia Geovani ; |
| Language : | French |
| Place of the course | Charleroi |
| Prerequisites | This course assumes the skills of the end of secondary school in analysis (functions, calculation of derivatives and integrals). |
| Main themes | The course emphasizes: <br><br>• the understanding of mathematical tools and techniques based on a rigorous learning of the concepts favored by the highlighting of their concrete application, <br>• the rigorous manipulation of these tools and techniques within the framework of concrete applications. <br><br>For most of the concepts studied, the applications are chosen within the framework of the other courses of the program in computer sciences (for example biology/chemistry). <br><br>• Sets and numbers <br>• One-variable real functions <br>• Boundaries <br>• Continuous functions <br>• Differentiable functions <br>• Integrals |
| Learning outcomes | **At the end of this learning unit, the student is able to :** <br><br>With regard to the AA reference system of the "Bachelor in Computer Science" program, this course contributes to the development, acquisition and evaluation of the following learning outcomes: <br>S1.G1 <br>S2.2 <br><br>S1.G1 Students who successfully complete this course will be able to: <br>S2.2 <br><br>• Model concrete problems using the notions of sets, functions, limits, derivatives and integrals; <br>• Solve concrete problems using limit, derivative and integral calculation techniques; <br>• Reasoning by correctly manipulating mathematical notations and methods keeping in mind but going beyond a more intuitive interpretation of concepts. |
| Evaluation methods | Students are assessed individually during a written exam on the basis of the learning outcomes announced above. In addition, homework results will be incorporated into the final grade as a bonus. The exact terms and conditions will be specified during the course. |
| Teaching methods | Lectures and exercise-based learning activities (APE). Online assignments will also be offered. The course and the learning activities through exercises will favor interactions between teachers and students. <br>Some of the above activities (lessons, APE, APP) can be organized remotely. |
| Content | The course emphasizes: <br><br>• the understanding of mathematical tools and techniques based on a rigorous learning of the concepts favored by the highlighting of their concrete application, <br>• the rigorous manipulation of these tools and techniques within the framework of concrete applications. <br><br>For most of the concepts studied, the applications are chosen within the framework of the other courses of the program in computer sciences (for example biology/chemistry). <br>The concepts covered in this course are described below. <br>Sets and numbers <br><br>• Sets (notation, intersection, union, difference) <br>• Interval, upper bound, lower bound, extremum <br>• Absolute value, powers and roots <br>• Cardinality of a set (finite and infinite) and notion of inclusion-exclusion |

- Equivalence
- Elements of logic and techniques of proof

One-variable real functions

- Injective, surjective and bijective functions
- Algebraic operations on functions (including graphical interpretation)
- Polynomial functions
- Exponential, logarithmic and trigonometric functions
- Composition of functions and inverse functions

Limits and continuity

- Conditions of existence
- Limits to infinity
- Fundamental theorems of continuous functions

Differentiable functions

- Derivative at a point (including graphical interpretation)
- Derivation techniques
- L'Hospital's theorem
- Maximum and minimum
- Concavity and convexity
- Linear function approximation
- Taylor expansion

Primitives and integrals

- Primitives
- Definite integrals (including graphical interpretation)
- Improper integrals
- Integration techniques

First-order ordinary differential equations

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| Faculty or entity in charge | SINC |

| Programmes containing this learning unit (UE) | | | | |
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| Program title | Acronym | Credits | Prerequisite | Learning outcomes |
| Bachelor in Computer Science | SINC1BA | 5 | | 🔍 |