UCLouvain

# lmat1122

*2023*

# Mathematical analysis : differentiation

| 8.00 credits | 45.0 h + 45.0 h | Q2 |
|---|---|---|

| | |
|---|---|
| Teacher(s) | Ponce Augusto ; |
| Language : | French |
| Place of the course | Louvain-la-Neuve |
| Prerequisites | Be able to manipulate algebraically and geometrically the functions of one and two variables and their derivatives. |
| Main themes | The course leads students to study mathematically the convergence of sequences, continuity and differentiability of functions of one and more variables, through the following topics :<br>• completeness of the set of real numbers and finite dimensional spaces,<br>• convergence of sequences: definition, examples and counter-examples, properties, method of successive approximations and application to real series,<br>• continuity : definition, examples and counter-examples, properties, limits and continuous extensions, global theorems,<br>• derivability and differentiability: definitions, examples and counter-examples, properties, higher order derivatives, Taylor expansion, free and constrained extremality conditions, implicit functions. |
| Learning outcomes | **At the end of this learning unit, the student is able to :**<br>1 By the end of this activity, the student will be able to :<br>• define mathematically the fundamental objects of the course<br>• state and prove the propositions and theorems of the course,<br>• illustrate the definitions, propositions and theorems with examples, counterexamples and applications,<br>• interpret geometrically the definitions, propositions and theorems,<br>• verify a property by means of its definition and characterizations,<br>• apply methods of demonstration seen in class to similar situations,<br>• analyze the properties of convergence of a sequence, the continuity or differentiability of a sequence or a function, described explicitly, implicitly or by recurrence, using the properties of the course and calculate the resulting objects<br>• solve free and constrained optimization problems, |
| Evaluation methods | Skill acquisition will be assessed in a final exam.<br>Questions will require :<br>• render material, including definitions, theorems, proofs, examples,<br>• select and apply methods from the course to solve problems and exercises<br>• adapt methods of demonstration from the course to new situations,<br>• synthesize and compare objects and concepts.<br>Assessment will include :<br>• the knowledge, understanding and application of the various mathematical objects and methods of the course,<br>• the rigor of the developments, proofs and justifications,<br>• the quality of the writing of the answers. |
| Teaching methods | The learning activities consist of lectures and practical sessions.<br>The lectures aim to introduce the fundamental concepts, to motivate them by showing examples and establishing results, to show their reciprocal links and their links with other courses in the Bachelor of Mathematical Sciences program.<br>The practical sessions aim at learning to choose and use methods of calculation and to construct demonstrations. |
| Content | Differential calculus in one and several variables :<br>• real numbers, vector spaces and sequences,<br>• continuity,<br>• differentiability,<br>• Taylor expansion,<br>• free and constrained optimization problems<br>• implicit functions and solving equations |

| | |
|---|---|
| Inline resources | Additional documents on Moodle. |
| Faculty or entity in charge | MATH |

| Programmes containing this learning unit (UE) | | | | |
|---|---|---|---|---|
| Program title | Acronym | Credits | Prerequisite | Learning outcomes |
| Bachelor in Mathematics | MATH1BA | 8 | | 🔍 |
| Bachelor in Physics | PHYS1BA | 8 | | 🔍 |