UCLouvain

linfo1111

2023

Analysis

7.00 credits	45.0 h + 37.5 h	Q1

Teacher(s)	Absil Pierre-Antoine ;Berger Guillaume ;Glineur François ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	This course assumes that the students already masters the skills in analysis (functions, derivatives and integrals) as expected at the end of secundary school.
Main themes	The course focuses on • understanding of mathematical tools and techniques based on a rigorous learning of concepts favored by highlighting their practical application, • careful handling of these tools and techniques in the framework of applications. For most concepts, applications are selected from the other courses of the computer science program (eg economy). Sets and Numbers • sets (intersection, union, difference) • Order and equivalence, • Interval, upper bounds, lower bounds, extremes, • absolute value, powers and roots Real functions of one variable • injective, surjective, bijective functions, • algebraic operations on functions (including graphic interpretation) • first order functions, • exponential, logarithmic and trigonometric functions • Composition of functions and inverse functions Limits • conditions to ensure that a limit exists, • limits to infinity Continuous functions • fundamental theorems of continuous functions, Differentiable functions • derivative at a point (including graphical interpretation) • The Hospital's theorem, • linear approximation of a function, • maximum and minimum, • encreasing of decreasing function (sign study) • concavity and convexity, • Taylor's development Integrals • primitive, • definite integrals (including graphic interpretation) • undefinite integrals Functions of two variables • notion and calculation of partial derivative • graphical interpretation of the gradient • interpretation and calculation of the Hessian matrix • Intuitive introduction to the use of the Hessian matrix and gradient for a 2-variable function to determine critical points and their nature • concept and calculation of double integrals For this last part, a mainly "tool" approach will be favored.

Learning outcomes	**At the end of this learning unit, the student is able to :** Given the learning outcomes of the "Bachelor in Copputer science" program, this course contributes to the development, acquisition and evaluation of the following learning outcomes: • S1.G1 • S2.2 1 Students completing successfully this course will be able to • Model real problems using the concepts of set, function, limit, derivative and integral; • Solve real problems using computational techniques for limit, derivative and integral; • Reason using correctly the mathematical notations and methods keeping in mind but exceeding a more intuitive understanding of the concepts; • Model real problems using functions of 2 variables.
Evaluation methods	Assessments are carried out individually in writing, based on the learning outcomes listed above. A test is organized during the first term, and a written exam during each session. For the January session, the final grade is awarded on the basis of the test (5 points out of 20) and the exam (15 points out of 20). For the other two sessions, the grade is based on the exam only.
Teaching methods	Lectures in a large auditorium, supervised exercise (APE) and problem (APP) sessions in small groups, possibly supplemented with writing assignments and online exercises.
Content	• Sets and numbers • Real univariate functions • Limits and continuity • Derivatives (computation and applications) • Optimization • Taylor polynomial • Integration (computation and applications) • Differential equations • Functions of two variables
Inline resources	https://moodle.uclouvain.be/course/view.php?id=2798
Bibliography	Mathématiques pour l'économie (5ème édition) par Knut Sydsæter, Peter Hammond, Arne Strøm et Andrés Carvajal, Pearson, 2020
Faculty or entity in charge	INFO

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Data Science : Statistic	DATS2M	7		
Bachelor in Computer Science	SINF1BA	7		