UCLouvain

linfo1114

2022

Discrete Mathematics

5.00 credits	30.0 h + 15.0 h	Q1

Teacher(s)	Saerens Marco ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	This course assumes that the student already masters notions of algebra covered by the course LINFO1112 *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.*
Main themes	**Set theory** • Set notations and operations • Binary relations between sets: applications and link with functions in analysis • Cardinality of a set (finite and infinite) and notion of inclusion-exclusion • Equivalence, equivalence classes **Logic** • Introduction to the logic of the proposals • Introduction to the logic of predicates • Prove methods • Mathematical induction • Notions of Boolean Algebra **Introduction to number theory** • Natural integer numbers, principle of recurrence, prime numbers, etc. • Euclidean division, representation in a base, modulo arithmetic, representation of the integers in the computer • Gcd, Euclid's algorithm • Basic notions of cryptography **Combinatorial mathematics** • counting • permutations • arrangements • Recurrence relations • Solutions of recurrence equations **Introduction to graph theory** • Oriented and non-oriented graphs and their matrix representations • Bipartite graphs and matching problems • Paths on a graph and Eulerian / Hamiltonian circuits • Planar graphs and coloring • Problems of shorter path • Ranking of the nodes of a graph: PageRank
Learning outcomes	**At the end of this learning unit, the student is able to :** Given the learning outcomes of the "Bachelor in Engineering" program, this course contributes to the development, acquisition and evaluation of the following learning outcomes: • S1.I1, S1.G1 • S2.2 Students who have successfully completed this course will be able to: 1 • Use the terminology of functions, relationships and together well and perform related operations when the context requires it • Explain the basic structure of the main proof techniques (direct proof, counterexample, proof by the absurd, induction, recurrence) • Apply the various proof techniques in a convincing way by selecting the most adapted to the problem posed • Analyze a problem to determine the underlying recurrence relationships • Calculate counts, permutations, arrangements on sets as part of an application.

	• Modeling various real-world problems encountered in computer science using the appropriate forms of graphs • Explain the problem of the shortest path in a graph and apply classical algorithms to solve this problem
Evaluation methods	A mandatory project/case study that counts for 3 out of 20 points. If the project report is not done (no report submitted), the student will get a 0/3 for this project. A written exam organized in session counting for 17 out of 20 points. Organized on-site or remotely, depending on the health situation.
Teaching methods	About 30 hours of lectures, on-site or remotely depending on the situation. A mandatory project/case study on the implementation of an algorithm.
Inline resources	On Moodle
Bibliography	Rosen K., Discrete mathematics and its applications, 8th edition, 2019. Mc Graw Hill.
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	5		🔍
Bachelor in Computer Science	SINF1BA	5	LINFO1112	🔍