UCLouvain

linma1691

2018

Discrete mathematics - Graph theory and algorithms

5 credits	30.0 h + 22.5 h	Q1

Teacher(s)	Blondel Vincent ;Delvenne Jean-Charles ;Jungers Raphaël (compensates Blondel Vincent) ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	This courses assumes that the elementary notions of discrete mathematics are acquired such as taught in LEPL1108. *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	Introduction to the language and theory of graphs : questions of characterization, isomorphism, existence and enumeration. Properties of directed and undirected graphs such as connectivity, planarity, k-colorability and the property of being Eulerian, perfect, etc. Modelling of practical problems : data structures and algorithms for the exploration of graphs. Basic graph algorithms and an analysis of their complexity.
Aims	AA1 : 1,2,3 More precisely, by the end of the course the student will be able to : 1 • model various problems in the language of graph theory • identify if a graph-theoretic problem has a known efficent algorithmic solution or not • propose and apply an algorithm to solve sucha a problem, at least for some classes of graphs • prove in a clear and rigorous fashion elementary properties related to the concepts covered in the course - - - - *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods	The students are evaluated individually through a written exam based on the specific objectives described above.
Teaching methods	The course is organized in lessons and supervised exercise sessions.
Content	Structure and characterization of graphs - basic concepts - degree, connected components, path, cycle, cut, minor, etc. Classes of graphs and their recognition - perfect, series parallel, planar graphs, acyclic digraphs, etc. Exploration of graphs and tests of their properties - k-connected, eulerian, etc. Flows - theorems of Menger and Hall, maximum flow and minimum cost flow algorithms and their complexity. Problems :finding optimal matchings and stable sets, the travelling salesman problem, cut, graph partitioning and graph colouring problems
Inline resources	http://icampus.uclouvain.be/claroline/course/index.php?cid=INMA1691
Bibliography	**Ouvrage de base :** Syllabus sur moodle **Aussi :** • Algorithmic Graph Theory, Alan Gibbons, Cambridge University Press 1985 • Introduction to Graph Theory, Douglas West, Prentice Hall 1996. • Combinatorial Optimization, W.R. Cook et al., Wiley 1998. • Network Flows, Ahuja et al., Prentice Hall 1993.
Faculty or entity in charge	MAP

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Computer Science and Engineering	INFO2M	5		
Master [120] in Electrical Engineering	ELEC2M	5		
Master [120] in Statistic: General	STAT2M	5		
Master [120] in Computer Science	SINF2M	5		
Bachelor in Engineering	FSA1BA	5	LEPL1108	
Minor in Engineering Sciences: Applied Mathematics	LMAP100I	5		
Additionnal module in Mathematics	LMATH100P	5		