LINGI2172
2013-2014

Databases

6.0 crédits	30.0 h + 30.0 h	2q

Enseignants:	Lambeau Bernard ;
Langue d'enseignement:	Français
Lieu du cours	Louvain-la-Neuve
Ressources en ligne:	> http://icampus.uclouvain.be/claroline/course/index.php?cid=lingi2172
Préalables :	Basic knowledge of database management, good abilities in programming.
Thèmes abordés :	* Data Base Management Systems (objectives, requirements, architecture). * The Relational data model (formal theory, first-order logic, constraints). * Conceptual models (entity-relationship, object role modeling). * Logical database design (normal forms & mp; normalization, ER-To-Relational) * Physical database design and storage (tables and keys, indexes, file structures). * Querying databases (Relational Algebra, Relational Calculus, Tutorial D, SQL) * ACID properties (Atomicity, Consistency, Isolation, Durability), Concurrency Control, Recovery techniques. * Programming database applications (JDBC, Database Cursors, Object-Relational Mapping, Relations as First-class Citizen). * Recent or more advanced trends in the database field (object-oriented databases, Big Data, NoSQL, NewSQL)
Acquis d'apprentissage	Students completing this course successfully will be able to : * Explain the scenarios in which using a database is more convenient than programming with data files; * Explain the characteristics of the database approach, where they come from and contrast them with current trends in the database field-- Identify and describe the main functions of a database management system; * Categorize conceptual, logical and physical data models based on the concepts they provide to describe the database structure; * Understand the main principles and mathematical theory of the relational approach to database management; * Design databases using a systematic approach, from a conceptual model through a logical level (i.e., a relational schema) into a physical model (i.e., tables and indexes); * Use SQL (DDL) to implement a relational database schema. Distinguish from SQL facilities with respect to the logical vs. physical distinction. * Query relational databases using SQL (DML). Contrast SQL with relational theory and cleaner languages such as Tutorial D. * Use relational databases either directly or from a conventional programming language; *La contribution de cette UE au développement et à la maîtrise des compétences et acquis du (des) programme(s) est accessible à la fin de cette fiche, dans la partie « Programmes/formations proposant cette unité d'enseignement (UE) ».*
Modes d'évaluation des acquis des étudiants :	Final grade following a 75% / 25% rule (final oral exam / participation and grade obtained to practical missions during the semester). 25% from practical missions applies in september too.
Méthodes d'enseignement :	The objectives are organized along three main axes: * Understand: both the historical context, and recent challenges and developments in the database field; relational theory, why is has been invented and how it fits in practice; implementation techniques and major algorithms for data organization, query and transaction processing. * Design: from conceptual modeling (e.g. Entity-Relationship, UML) down to physical database tuning (e.g. indexes, query plans), through logical database design (e.g. functional dependencies, normal forms, normalization algorithms) and reasoning (relational algebra, views and constraints). * Use: installing and configuring database management systems, creating and tuning databases, using query languages in practice (e.g. SQL), connecting to databases (e.g. call interfaces, ORMs), integrating database systems in software designs. Theory and practice are acquired by students along those three axes as follows: * Theory is dispensed in the traditional way, through two-hours auditorium sessions during the second quarter. The theoretical course follows Elmasri & mp; Navathe's textbook [EN10]. * Practice is acquired by students through 4 practical database missions of 2-3 weeks each. Some missions are achieved by groups of four students. * Both theory and pratical missions are dispensed in English.
Contenu :	-- Introduction au modèle entité-association

	-- Bases du modèle relationnel: structures de données et algèbre. -- Langages relationnels de définition et de manipulation basés sur la logique. -- Etude critique du langage SQL. -- Programmation d'applications de bases de données. -- Fonctions et architecture des logiciels de gestion de bases de données. -- Gestion des accès simultanés aux bases de données et techniques associées de récupération en cas de panne.
Bibliographie :	* [EN10] Ramez Elmasri and Shamkant Navathe Fundamentals of Database Systems. Addison-Wesley Publishing Company, USA, 6th edition, 2010. * [Dat04] Chris J. Date. An Introduction to Database Systems. Pearson Addison-Wesley, Boston, MA, 8 edition, 2004. * [Dar12] Hugh Darwen, An Introduction To Relational Database Theory, 3th Edition, Bookboon, 2009 * [Hai12] Jean-Luc Hainaut, Bases de Données, Concepts, Utilisation et Développement, 2e Edition, Dunod, 2012 * [CB05] T.M. Connolly and C.E. Begg. Database Systems: A Practical Approach to Design, Implementation, and Management. Number v. 1 in International computer science series. Addison-Wesley, 2005. * [Rel08] Dave Voorhis. Rel, An Implementation of Date and Darwen's Tutorial D database language. http://dbappbuilder.sourceforge.net/ Rel.php. Accessed: 2013-08-30.
Cycle et année d'étude: :	> Master [60] en sciences informatiques > Master [120] en sciences informatiques > Master [120] : ingénieur civil en informatique
Faculté ou entité en charge:	INFO