Module: Database Development 371

Module name:	Database Development 371
Code:	DBD371
NQF level:	7
Type:	Core – Bachelor of Information Technology
Contact Time:	30 hours
Structured Time:	6 hours
Self-Directed Time	34 hours
Notional hours:	70 hours
Credits:	7
Prerequisites:	DBD271

Purpose

The aim of the module is to enhance the knowledge of database systems by deepening the understanding of the theoretical and practical aspects of database technologies, and showing the need for distributed database technology to tackle deficiencies of the centralized database systems. Introducing principles and implementation techniques of distributed database systems, expose active and emerging research issues in distributed database systems and application development. Finally apply theory to practice by building and delivering a distributed database query engine, subject to remote Web service calls.

Outcomes

Upon successful completion this module, the student will be able to:

- Demonstrate an understanding of database design and computation techniques for parallel and distributed database technology, not only at the algorithmic level but also in a system setting.
- Demonstrate integrated knowledge of the techniques used for data fragmentation, replication, and allocation in the distributed database design process.
- Interpret and Evaluate simple strategies for executing a distributed query to select the strategy that minimizes the amount of data transfer.
- Produce and present information related to a given distributed database architecture.
- Develop a system to support distributed transactions in such databases.
- Select and use distribution techniques in order to recommend mechanisms to control data fragmentation in distributed databases.
- Demonstrate ability to gather sufficient information related to decisions based on data relevance of multiple data sources, in order to compare different systems relevant for designing distributed databases systems
- Apply technical knowledge and skills to optimally solve industry-based problems by synthesizing sustainable database distribution technologies.
- Produce and present information related to the usage of networked distributed database systems using well-formed arguments and incorporating own ideas – consistent with industry standard practices.

Assessment

Assessment is performed using a variety of instruments:

- Continuous evaluation of theoretical work through an assignments, formative and a summative test.
- Continuous evaluation of project work, whereby the student must design a Data-Distribution Service using UML, thus providing a platform-independent model that can then be mapped into a variety of concrete platforms and programming languages.
- Final assessment through a written examination.

Teaching and Learning

Learning materials

Prescribed Book

Distributed Databases: Administration – IT Without Frontiers series

Additional Material

- 📖 Özsu, M.T., Valduriez, P. (2011), *Principles of Distributed Database Systems, Third Edition*, Springer-Verlag New York. [ISBN 978-1-4419-8833-1]
- 📖 Elmasri, R., Navathe, S. (2010). *Fundamentals of Database Systems.* Addison Wesley Longman, Inc. [ISBN: 978-0136086208]
- 📖 Mark L. Gillenson. (2004). *Fundamentals of Database Management Systems.* Wiley E -Books.

Learning activities

The teaching is a combination between presentation of theoretical concepts, exercises and discussions. It is practically oriented, with mandatory projects which must be completed during the course.

Notional learning hours

Activity	Units	Contact Time	Structured Time	Self-Directed Time
Lecture		27.0		13.0
Formative feedback		3.0		
Project				
Assignment	2			6.0
Test	2		4.0	8.0
Exam	1		2.0	7.0
		30.0	**6.0**	**34.0**

Syllabus

- Part 1: DDBMS – overview
  - Evolution of distributed database systems
  - Distributed database systems overview

- o Overview of parallel processing system
- o Overview of parallel database design
- o Distributed database concepts
- o Overview of computer networking
- o The internet and the world-wide web (www)
- o Distributed database design concepts
- o data fragmentation
- o Transparencies in distributed database design

- Part 2: DDBMS – basics
  - DDBMS – DDBMS concepts
    - o Database and database management system
    - o Database schemas
    - o Types of DBMS
    - o Operations on DBMS
  - DDBMS - distributed databases
    - o Distributed database management system
    - o Factors encouraging DDBMS
    - o Advantages of distributed databases
    - o Adversities of distributed databases

- Part 3: distributed database design
  - DDBMS – distributed database environments
    - o Types of distributed databases
    - o Distributed DBMS architectures
    - o Architectural models
    - o Design alternatives
  - DDBMS – design strategies
    - o Data replication
    - o Fragmentation
    - o Vertical fragmentation
    - o Horizontal fragmentation
    - o Hybrid fragmentation
  - DDBMS – distribution transparency
    - o Location transparency
    - o Fragmentation transparency
    - o Replication transparency
    - o Combination of transparencies
  - DDBMS – database control
    - o Authentication
    - o Access rights
    - o Semantic integrity control