APT 1050: DATABASE SYSTEMS

Prerequisites: APT 1030 Fundamentals of Programming Languages

3 Credit Units

Rationale

The course aims at introducing the basic concepts of database design and manipulations. It is not an overstatement that the market value of an IT professional grows significantly with the expertise in databases, particularly the understanding of database design and SQL programming. This is because a vast majority of positions in information technology require at least some form of interaction with database systems. The likelihood of an IT professional at some point encountering databases at their present or future jobs in the IT industry is almost certain. In this respect, and the immense importance of databases for students' future careers, this course is meant to teach students practical skills, particularly useful for future database specialists, database administrators, general database users, and application developers. It is also useful for the developers of any distributed or client/server system that deals with persistent data. Moreover, the course is an important stepping stone for anybody who aspires to become a knowledge worker in the area of information systems. It provides a solid foundation not only for the later study of advanced database systems, but also for the study of other advanced areas in information systems, including data warehousing, data mining, information security among others.

Description

The course covers the design and use of modern relational databases. Topics include file structures, hierarchical and network data models in addition to the relational model and relational algebra. SQL is also introduced. Models for database design are presented and compared. Also addressed are current trends in database including object-oriented and functional models as well as distributed databases and database security issues. The course introduces the concepts of database design, techniques of entity modeling and structured query languages (SQL).The course provide students with a strong foundation in systematic approaches to design and implementation of database applications.

Learning outcomes

Having successfully completed this subject, the student will be able to:

1. Apply techniques of entity modeling in database design

2. Use SQL statements to query databases

3. Explain the role of databases and applications in business organizations

4. Explain the importance of data integrity and data quality

5. Describe and demonstrate data modeling

6. Use SQL to define and manipulate data in an industrial-strength database (i.e. Sybase, Oracle, MSSQL)

7. Use visual programming tools (i.e. PowerBuilder) to develop client/server information systems

8. Explain the database facilities (concurrency control, recovery, security etc.) typically required by business-critical systems

9. Define key terms in database design

Content

An Introduction to Database Management systems: data, information, data independence; concepts of database systems; three levels of the architecture; database system architecture; the catalogue. **Relational Database Management Systems**: main principles: examples. **An Introduction and overview of SQL**: history; data types; data manipulation; commands; SQL standards comparison; data manipulation languages, e.g. QBE and XML. **Integrity; constraints; database constraints;** keys SQL facility. **Normalization**: first, second and third normal forms; Boyce/Codd normal form; fourth and fifth normal form. **Database Design**: semantic modeling; ER modeling: transformation to relation model. **Transaction Management, Security and Optimization:** recovery; concurrency security; SQL facilities; optimization. **Distributed Databases:** objectives; client / server systems; distributed DBMS. **Object and Object/Relational Databases**: objects, classes, methods and messages; examples; benefits and costs; O and O/R databases comparison. Enterprise Wide Information System. Emerging Trends in Database Management System. Introduction to Knowledge Database.

Teaching Methodology

The course will be taught by lecture, group work, in-class exercises, case studies and demonstrations (labs exercises).

Instructional Materials/Equipment

Current Microsoft SQL Server installed. Oracle latest version installed

Methods of Evaluation

Laboratory Work	20%
Project	20%
Assignments	10%
Mid-semester	20%
Final semester exams	30%
Total	**100%**

Course Text

Database systems: design, implementation, and management by *Peter Rob, Carlos Coronel 2009*

Recommended Reading

Database systems: a practical approach to design, implementation, and management by *Thomas M. Connolly, Carolyn E. Begg 2005*

Database system concepts by Silberschatz, Abraham 2006 (USIU)

Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, 5th Edition, Addison-Wesley, 2007.

Database Management Systems, R. Ramakrishnan and J. Gehrke, third edition, McGraw-Hill

Modern Database Management 7th Edition – by Hoffer, McFadden, and Prescott. Published by Addison Wesley.

Thomas Connolly and Carolyn Begg: Database Systems: A Practical Approach to Design, Implementation and Management. 2nd Edition, Addison-Wesley, 2004.