Code: ING-INF/05	**Credits: 9**
Matter: Relational databases and SQL	
Main language of instruction: Italian	
Other language of instruction: English	

Teaching Staff

Head instructor
Prof. Daniele PASQUINI - daniele.pasquini@unicusano.it

Introduction

1. Objective of the course :

"Relational Databases and SQL" course aims to provide students a solid knowledge about the design of databases. The course proposes the basic concepts of algebra and relational calculus and declines them in the study of the Entity-Relationship model and the design of relational databases. Furthermore, the course's educational objective is to provide students knowledge about the DBMS based on SQL (Structured Query Language) and its use. The E-tivities allow students to design a relational database based on a use case.

Objectives

2. Course Structure:
1. Basics of Algebra and Relational Calculus
2. Design of databases based on the Entity-Relationship model
3. DBMS and SQL language
4. Issues relating to relational databases
5. Interaction with relational databases through the use of SQL as Data Definition Language (DDL) and Data Management Language (DML)

Competencies:

A.   Knowledge and understanding.
The student will have knowledge about the issues related to relational databases and their management systems based on SQL, and the design of a database based on the Entity-Relationship method. Furthermore, through the E-tivities students will acquire the ability to implement their own projects, based on case studies, using a DBMS (DataBase Management System).

B.   Applying knowledge and understanding.

The student will be able to use tools, development environments and methods to tackle database design problems; he/she will also be able to use the basic functionalities of database management systems, such as definition, update, and queries.

C.   Making judgements.

The student will be able to perform an analysis of a complex database system and will be able to design it in a database management software (DBMS).

D.   Communication skills.

The student will be able to describe and hold conversations on topics related to the design of databases, using the right terminology to describe the processes of analysis and design database, with ad-hoc software solutions

E.   Learning skills.

The student will know the problems of design and management of a relational database. He can use the acquired knowledge in different contexts, with other data models and data management systems

Syllabus

3. *Programme of the course:*

Subject 1. Introduction to Databases and relational model.
Introduction to data model, database, database management system, relational model.

Subject 2. Conceptual and logical data model

Subject 3. Algebra
Basics of Algebra
Queries in Algebra

Subject 4. Relational calculus
Basics of Relational Calculus
Queries in Relational Calculus

Subject 5. Introduction to SQL
SQL, a first approach
SQL for applications
Techniques to design databases

Subject 6. Physical data model and normalization

Subject 7. Queries and transactions.
How to write queries in SQL: main constructs (select, from, where, join, group by, order by)
What is a transaction in SQL
Transaction Manager

Subject 8. App development.
Use of external Python package to connect and interact with SQL databases.

Evaluation system and criteria

The examination consists of a written test. This includes:
- 2 questions about database design
- 3 questions about Algebra and SQL queries

In addition, four e-tivities, consisting of requirements analysis and collection, ER model, logical and normalized model, Algebra and SQL queries, sample app in Python . These need to be sent to the instructor in advance of the examination. Each E-tivity counts 3 marks for a total of 12 out of 30 marks.

Bibliography and resources

4. *Materials to consult*

Notes written by the instructor (available in Italian). The notes cover the course contents and examination program
.
5. *Recommended bibliography*

Suggested readings are:

- P. Atzeni, S. Ceri, S. Paraboschi, R. Torlone, "Basi di Dati: Modelli e Linguaggi di Interrogazione", 5a edizione (2018), McGraw-Hill