COURSE DETAILS

"BASI DI DATI"

SSD ING-INF/05

DEGREE PROGRAMME: BACHELOR DEGREE IN COMPUTER ENGINEERING

ACADEMIC YEAR: 2023-2024

GENERAL INFORMATION – TEACHER REFERENCES

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GENERAL INFORMATION ABOUT THE COURSE

INTEGRATED COURSE (IF APPLICABLE): N.A.

MODULE (IF APPLICABLE): N.A.

CHANNEL (IF APPLICABLE): N.A.

YEAR OF THE DEGREE PROGRAMME (I, II, III): III

SEMESTER (I, II): I

CFU: 9

REQUIRED PRELIMINARY COURSES (IF MENTIONED IN THE COURSE STRUCTURE "REGOLAMENTO")
Fondamenti di informatica.

PREREQUISITES (IF APPLICABLE)
None.

LEARNING GOALS
The course presents the main methodologies for the design of a relational database and the fundamental characteristics of database system technologies and architectures. Downstream of this module, students must have acquired concepts related to data modeling in software systems, the characteristics of an information and computer system, the characteristics of a transactional system, the use of SQL (Structured Query Language) and SQL immersed in programming languages and the physical organization of a database system.

EXPECTED LEARNING OUTCOMES (DUBLIN DESCRIPTORS)

Knowledge and understanding
The training course aims to provide students with the basic knowledge related to relational databases, as well as those related to technologies and architectures of database systems. In addition, all the methodological and technological tools will be provided to support the design of relational databases and those for their management through the use of SQL language and DBMS (DataBase Management System) software. In particular, these tools will allow students, on the one hand, to know how to create and administer a database system, on the other, to configure it in the most appropriate way to support the applications that interact with it.

Applying knowledge and understanding
The training course is aimed at transmitting the methodological and operational skills and tools necessary to concretely apply the knowledge related to relational databases and SQL language for the creation and management of database systems. In particular, the student must demonstrate to be able to design, create, populate and query a relational database, as well as to manage its implementation through the use of a DBMS.

COURSE CONTENT/SYLLABUS

Part Prima: Relational databases (6 CFU)

1. Computer systems. Information and computer systems. Databases and management systems (DBMS).
2. The relational model. Relationships and tables. Databases and integrity constraints. Defining data in SQL.
3. The Relationship Entity model. Design of databases. Entities, associations, and attributes. Conceptual design and examples. From the conceptual scheme to the relational scheme. Review of schemes. Translation into the logical model.
4. The Advanced Relationship Entity model. Inheritance: superclasses and subclasses. Hierarchies of generalization and specialization. Resolving hierarchies.
5. Operations. Set operations. Changing the status of the database. Relational operations in procedural and declarative form (SQL). Selection, Projection, Join. Renaming and use of variables. Aggregation and grouping functions. Set and nested queries. Views. SQL query syntax. The complete syntax of Insert, Update, and Delete.
6. Normal forms. Redundancies and anomalies in the modification of a relationship. Functional dependencies. Functional constraints and dependencies; Full dependencies. The three normal forms and decomposition techniques. The normal form of Boice and Codd.
7. SQL and programming languages. ODBC, JDBC, triggers.

Part Two: Technology of a DBMS (3 CFU)

1. Physical design of a database. Physical organization and query management. Access Structures.

2.   Query handler.
3.   Transactions. Reliability control and concurrency control.
4.   Distributed database technology. Replicated databases.
  Notes on object-oriented databases. Directional databases.

READINGS/BIBLIOGRAPHY

  Textbook:
o   Chianese, Moscato, Picariello, Sansone. "*Sistemi di basi di dati ed applicazioni*". Apogeo Education-Maggioli Editore. Settembre 2015.
  Course slides and supplementary material.

SEE WEBSITE OF THE TEACHER OF THE SUBJECT

TEACHING METHODS

The teacher will use lectures for about 60% of the total hours, and in addition computer exercises, both assisted and personal, to practically deepen the theoretical aspects through the tools introduced, and in-depth seminars for the remaining hours. Everything will be supported by multimedia teaching material available online.

EXAMINATION/EVALUATION CRITERIA

a) Exam type:

Exam type	
written and oral	
only written	X
only oral	
project discussion	X
other	

In case of a written exam, questions refer to:	Multiple choice answers	
	Open answers	X
	Numerical exercises	

The written test contains, in addition to exercises, also theoretical questions.

b) Evaluation pattern: The written test weighs about 90% on the final evaluation, while the project work weights about 10%.