



**NATIONAL UNIVERSITY OF ENGINEERING  
COLLEGE OF SCIENCES  
COMPUTER SCIENCE PROGRAM**

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**CC331 – DATABASE**

**I. GENERAL INFORMATION**

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|-----------------------|-----------------------------|
| <b>CODE</b>           | : CC331 – Database          |
| <b>SEMESTER</b>       | : 5                         |
| <b>CREDITS</b>        | : 4                         |
| <b>HOURS PER WEEK</b> | : 6 (Theory – Practice)     |
| <b>PREREQUISITES</b>  | : CC301 Parallel Algorithms |
| <b>CONDITION</b>      | : Mandatory                 |

**II. COURSE DESCRIPTION**

Introduces the concepts and evolution of the database system. Introduces the relational model. Covers aspects of concurrency, reliability and information search using the SQL language.

**III. LEARNING UNITS**

**1. Introduction**

- I: What is a database?
- II: What is a database management system?
- III: Independence of the data.
- IV: Architecture of a database system.

**2. Entity model, relationship (E/R)**

- I: Introduction to the ER data model.
- II: Sets of entities and relationships.
- III: Domains.
- IV: Equivalent representations of a relationship.
- V: Design issues.
- VI: Specialization.
- VII: Aggregation.
- VIII: Reduction to tables.

**3. The relational model. Conversion of E/R**

- I: Introduction.
- II: Schemes, Tuples, Tables, Domains.

- III: Conversion to tables from a model with relationships.
- IV: Conversion to tables from a generalized model.
- V: Discovery of keys in relationships.

#### **4. Functional dependencies**

- I: Definition.
- II: Armstrong axioms.
- III: Additional Rules.
- IV: Key of a set of attributes.
- V: No redundancy.
- VI: Determination of the keys of a scheme and calculation of the keys of a relational scheme.

#### **5. Normalization. Dependencies of multiple values**

- I: Redundancy, Update anomalies and Elimination.
- II: First and Second Normal form.
- III: Decomposition without loss.
- IV: Preservation of dependencies.
- V: Boyce-Codd Normal Form (BCNF).
- VI: Third Normal form, BCNF vs 3NF.
- VII: Fourth and Fifth Normal form.

#### **6. Introduction to SQL**

- I: Applications of the databases.
- II: Database systems versus file systems.
- III: Vision of the data.
- IV: Database models.
- V: Database languages.
- VI: Transaction management.
- VII: Structure of a database system.
- VIII: Users of databases.

#### **7. Aggregations, modifications, and advanced operations**

- I: Aggregations and design of aggregations.
- II: Modification of data.
- III: Classification, insert tuples in a relation, remove tuples from a relation and update the value of some components of existing tuples.

#### **8. Views and data definition**

- I: Vision concept.
- II: Applications of views.
- III: Views in SQL.
- IV: Syntax.
- V: Reasons why a list is not updatable.
- VI: View on a basic table.
- VII: View on a concatenation of relationships.
- VIII: Define tables, rows and columns.
- IX: Insert index keys.

- X: Create relationships between tables.
- XI: Assign data types.

## **9. Restrictions and dissipators (triggers)**

- I: Restrictions on stored procedures and dissipators.
- II: Restrictions on subqueries.
- III: Restrictions on views.
- IV: Definition, use and syntax of the trigger.
- V: Components and names of triggers.
- VI: Types of dissipators.
- VII: Order of activation of dissipators.

## **10. Persistent storage modules**

- I: Storage and file structure.
- II: Indexing, association, hashing.
- III: Indexes.
- IV: Processing of queries.
- V: Optimization of queries.

## **11. Embedded SQL systems. CLI, and JDBC**

- I: Introduction to the development of Applications with Databases.
- II: Embedded SQL and Dynamic SQL.
- III: Access to databases: ODBC, SQLJ, SQL / CLI.
- IV: 4GL environments and databases.
- V: Other technologies for data access: JDBC and ADO.NET.

## **12. Authorization**

- I: Security violations.
- II: Control of access to the database.
- III: Types of authorization.
- IV: Authorizations and views.
- V: Granting privileges.
- VI: Elimination of privileges.
- VII: The concept of role or paper.
- VIII: Limitations of the SQL authorization.

## **13. Transactions**

- I: Introduction.
- II: Sentences for a transaction.
- III: Nested transactions.
- IV: Transactions and stored procedures.

## **14. Object oriented database**

- I: What is a BDOO?
- II: Architecture of A BDOO.
- III: Development with OO Databases.
- IV: Three Approaches to the Construction of OO Databases.

V: Impact of Object Orientation in Software Engineering.  
VI: Advantages in BDOOs.  
VII: Performance.

## **15. Semi-structured data and XML**

I: Semi-structured Data Model.  
II: Structure of the data in XML.  
III: HTML vs. XML IV: Basic XML syntax.  
V: DTD and XML-Schema.  
VI: XML Query Data Model.  
VII: XML Query algebra.  
VIII: XML Query language.

## **16. Data Warehouse and Data Mining**

I: Data Warehouse, Introduction to Data Warehouses.  
II: Introduction to data mining.  
III: Exploitation of data warehouses OLAP tools.  
IV: Classification problems.  
V: Supervised learning.  
VI: Methods of grouping.  
VII: Unsupervised learning.  
VIII: Design of data warehouses.  
IX: Maintenance of data warehouses.  
X: Web Mining.

## **IV. BIBLIOGRAPHY**

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