# IIC2413 DATA BASE

<table>
<thead>
<tr>
<th>Credits and contact hours:</th>
<th>10 UC credits / 10 hours (3h lectures; 1.5 h assistantships; 5h Individual learning experience (project))</th>
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<tbody>
<tr>
<td>Instructor’s name:</td>
<td>Juan Reutter</td>
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<tr>
<td>Course coordinator’s name</td>
<td>None</td>
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<td>Course Catalog Description:</td>
<td>Databases are at the core of commercial application development, and are necessary for any application that requires storing, querying or updating large volumes of data. The purpose of this course is to introduce the student to the design and use of database management systems, specifically relational databases and XML databases.</td>
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<tr>
<td>Prerequisite Courses:</td>
<td>IIC2233 Advanced computer programing</td>
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<td>Co-requisite Courses:</td>
<td>No</td>
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<td>Status in the Curriculum:</td>
<td>Required</td>
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| Course Learning Outcomes: | 1. Understand what a database management system is, and know the advantages and disadvantages of the relational and XML models.  
                               2. Design relational databases for applications based in real life scenarios.  
                               3. Use the SQL query language for relational databases.  
                               4. Understand fundamental concepts of database theory, especially relational algebra, and understand how to use this theory to study the limitations of database systems.  
                               5. Know basic notions of the XML model  
                               6. Understand the most important challenges faced by the database industry. Discuss and know how to elaborate design and implementation solutions for database systems. |
Relation of Course to ABET Criteria:

- a. Knowledge of mathematics, science and engineering
- c. Design a system, component, or process
- d. Multidisciplinary teams
- e. Identify, formulate, and solve engineering problems
- f. Professional and ethical responsibility
- g. Effective communication
- h. Broad education necessary for global, economic, environmental and societal context
- i. Recognition of the need for, and an ability to engage in lifelong learning
- j. Knowledge of contemporary issues
- k. Techniques, skills, and modern tools for engineering practice

Topics covered:

1. Database systems
   - a. Importance of databases
   - b. Database systems against ad-hoc storage.
   - d. Evolution of database systems.
   - e. Basic architecture of database systems.
2. Introduction to the relational model: basic concepts, basic SQL.
3. Modelling (design)
   - a. Creation of tables
   - b. Modelling languages; E/R diagrams
   - c. Principles of design.
   - d. From E/R diagrams to relational schemas.
   - e. Modelling of constraints, normal forms.
4. Advanced SQL
   - a. Outerjoins and null values.
   - b. Views.
   - d. Stored procedures and cursors.
   - e. Transactions and concurrency control.
   - f. Management tools.
5. Theoretical concepts: Relational algebra, limitations of SQL (nulls, transitive closure, etc.)
6. Indexing and optimization
   - a. Processing of relational operators.
   - b. Optimization of relational queries.
   - c. Indexes.
7. Other data models
   - a. XML.
   - b. Languages XPath and XQuery.
   - c. Semistructured models, object oriented databases.