Databases

Introduction to the Databases Course

João R. Campos

Bachelor in Informatics Engineering
Department of Informatics Engineering
University of Coimbra
2024/2025

Databases Course

- Scientific Domain: Computer Science / Informatics
- Program: Bachelor in Informatics Engineering
  - *Licenciatura em Engenharia Informática* (LEI)
- Curricular Year: 2nd
- Semester: 2nd
- ECTS: 6 = 162 hours of effort
- Effort:
  - Theoretical (T): 2:00h per week, total effort of 24 hours
  - Theoretical-Practical (TP): 1:00h per week, total effort of 12 hours
  - Practical Labs (PL): 2:00h per week, total effort of 28 hours

The Team

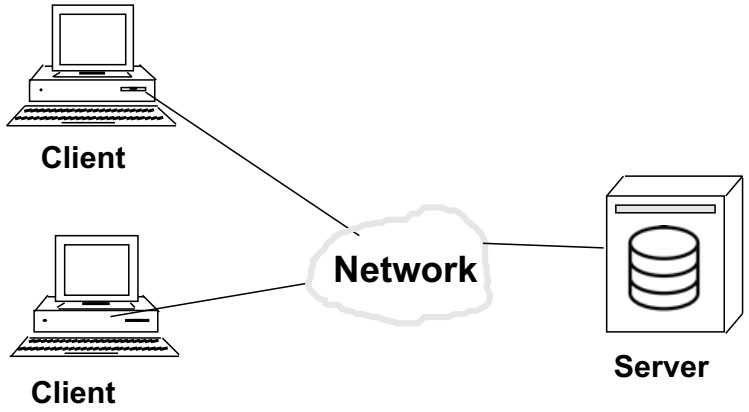
- Course coordination, T and TP classes:
  - João R. Campos, jrcampos@dei.uc.pt Office: D 3.6
  - Office hours:
    - Monday and Thursday 9:00h to 11:00h; *or at any other time; but **always send** me an email so that I can reserve that time for you; many students, many courses, same office hours*
- Research areas
  - AI to improve **dependability** and **security** of complex systems
  - Improving the dependability of AI
- Teaching areas
  - Databases
  - Introduction to Programming
  - Advanced Machine Learning
  - …

The Team

- PL classes:
  - Adorilson Araujo <adorilsonaraujo@dei.uc.pt>
  - Gonçalo Carvalho <gcarvalho@dei.uc.pt>
  - João R. Campos <jrcampos@dei.uc.pt>
  - Pedro Sousa <pesousa@dei.uc.pt>

What will you learn?

- What is a (relational) database?
- How to install and configure a database server?
- How to design a database schema?
- How to develop a database application?
  - Including database specific languages
- What are the main database administration tasks?
  - Including security challenges



Syllabus – T & TP Classes

- Relational Model & Structured Query Language (SQL)
- Entity-Relationship Model
- Functional Dependencies and Database Normalization
- Transactions and Concurrency Control
- Development of Database Applications

Syllabus – T & TP Classes

- Data Storage and Indexing
- Database Performance Tuning and Query Optimization
- Database Administration and Security
- Data Warehouses and OLAP
- Big Data Storage and NoSQL Databases

Syllabus – PL Classes

- Installing a Database Management System (DBMS)
- SQL
- Entity-Relationship Model
- Transactions and Concurrency Control
- Procedural SQL (PL/pgSQL)
- Database Indexing and SQL Tunning

- Each student must attend the class they enrolled

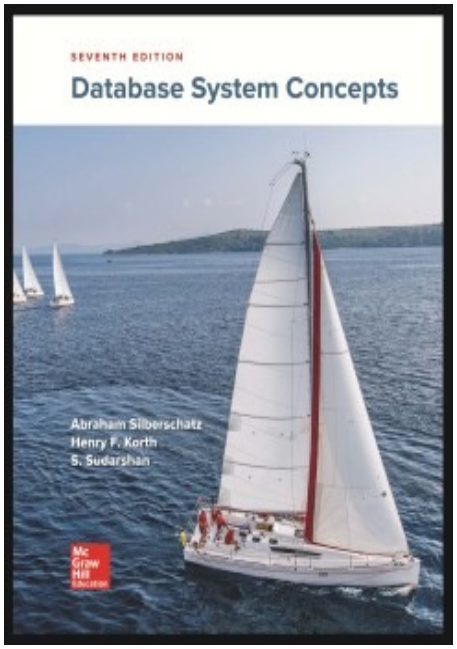
  Some time devoted to monitoring/assessing the status of the practical assignment!

Schedule for the Semester

	Week	T	Book	TP	PL
1	03/02/2024	Introduction to Databases	Cap. 1	Introduction to SQL	Installing a DBMS (PostgreSQL)
2	10/02/2024	Relational Model & SQL	Cap. 2 & 3	Developing a Simple Database Application	SQL
3	17/02/2024	Entity-Relationship Model	Cap. 6	Entity-Relationship Model	SQL
4	24/02/2024	Entity-Relationship Model	Cap. 6	Entity-Relationship Model	SQL
5	03/03/2024	Functional Dependencies and Database Normalization	Cap. 7	Functional Dependencies and Database Normalization	SQL
6	10/03/2024	Transactions and Concurrency Control	Cap. 17	Transactions and Concurrency Control	Entity-Relationship Model
7	17/03/2024	Transactions and Concurrency Control	Cap. 18 & 19	Transactions and Concurrency Control	Entity-Relationship Model
8	24/03/2024	Development of Database Applications	Cap. 8 & 9	Introduction to Procedural SQL (PL/pgSQL)	Course Project - Midterm Presentation
9	31/03/2024	Data Storage and Indexing	Cap. 13 & 14	Database Indexing (cont. T lesson)	Database Application
10	07/04/2024	Database Performance Tuning, Query Execution, and Indexing	Cap. 15 & 16	Database Indexing	Transactions and Concurrency Control
11	14/04/2024			Easter	
12	21/04/2024		Easter		PL/pgSQL
13	28/04/2024	Database Administration and Security		SQL Tuning	PL/pgSQL
14	05/05/2024	Data Warehouses and OLAP	Cap. 20	Data Warehouse Modelling	Database Indexing and SQL Tuning
15	12/05/2024	Big Data Storage and NoSQL Databases	Cap. 10 & 11	NoSQL	NoSQL
16	19/05/2024	Syllabus Overview and Revision			Questions, Project, Exercises

Bibliography

- Slides and other materials
  - Will be provided during the semester
- Documentation from DBMS providers
  - PostgreSQL, Oracle…
  - Available online
- Abraham Silberschatz, Henry F. Korth, S. Sudarshan, “Database System Concepts”, 7th Edition, McGraw Hill Education, 2019
  - https://www.db-book.com/
- Carlos Coronel, Steven Morris, “Database Systems: Design, Implementation, and Management”, 12th Edition, Cengage Learning, 2017



Format for the Lessons

- Theoretical (T)
  - Present and discuss key concepts, including demos and examples
- Theoretical-Practical (TP)
  - Application of concepts in concrete examples / exercises
- T and TP will be merged, shorter exposition
  - focusing on relevant rationale, giving time for questions and discussions
  - full-extent materials will be made available for independent study
  - I'll be in the classroom for the whole period, as long as there are questions
- Practical Labs (PL): 8 different classes / slot
  - Hands-on, exercises, discussion… **Download the materials before class!**
  - Arrive on time for the lessons

Assessment

- Exam:
  - Weight: **14 points** (minimum of 35%)
  - Consultation: 1 A4 sheet (front & back)
  - Theoretical and practical questions

Assessment

- Practical Assignment / Project:
  - Weight: **6 points** (minimum of 35%, 0 if minimum not achieved), groups of **3 (from the same PL/Professor)**
  - Statement of Work ("*enunciado*"): week of Feb. 17
  - Midterm deadline: March 21 (defenses in W8 PL classes - 35% of the grade)
  - **2 checkpoints** in W12 and W14 (5% + 5% of the grade)
  - Final delivery (55% of the grade):
    - Deadline: May 22 (defenses after *Queima*)
  - Submission at *Inforestudante* for both midterm and final submissions
  - Enrollment in defenses mandatory at *Inforestudante* (slots will be made available)
    - every student must participate, defenses are **individual**
  - **Submission of ChatGPT/Copilot/… solutions is considered as fraud**

Resources and Generalities

- Resources made available at *UCx*
- Attending classes is of utmost importance! (but do not come to disrupt)
  - You are responsible for marking your presence at *ucstudent*
- **Plagiarism and fraud** → Fail the course + **disciplinary procedure FCTUC**
    - Work by **ChatGPT and similar** is **not yours**
    - There is a difference between using something to **improve your learning** vs **prevent you from learning**
- Questions → Talk to one of the professors whenever necessary
- Your *feedback* is always welcome

Q&A

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