

SYLLABUS

1. Data about the program of study

1.1 Institution	The Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Automation and Computer Science
1.3 Department	Computer Science
1.4 Field of study	Computer Science and Information Technology
1.5 Cycle of study	Bachelor of Science
1.6 Program of study / Qualification	Computer science / Engineer
1.7 Form of education	Full time

2. Data about the subject

2.1 Subject name	DataBase Design				Subject code	46.1
2.2 Course responsible / lecturer	Lect. dr. eng. Antal Marcel - Marcel.Antal@cs.utcluj.ro					
2.3 Teachers in charge of seminars / Laboratory / project	Lect. dr. eng. Cenan Călin - Calin.Cenan@cs.utcluj.ro Assist. eng. Bindea Bogdan - Bogdan.Bindea@cs.utcluj.ro					
2.4 Year of study	IV	2.5 Semester	7	2.6 Type of assessment (E - exam, C - colloquium, V – verification)	E	
2.7 Subject category	Formative category: DF – fundamental, DS – speciality, DC – complementary					DS
	Optionality: DOB – mandatory, DOP – optional (alternative), DFA – optional (free choice)					DOP

3. Estimated total time

3.1 Number of hours per week	4	of which:	Course	2	Seminars	-	Laboratory	2	Project	-
3.2 Number of hours per semester	56	of which:	Course	28	Seminars	-	Laboratory	28	Project	-
3.3 Individual study:										
(a) Manual, lecture material and notes, bibliography										22
(b) Supplementary study in the library, online and in the field										20
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										12
(d) Tutoring										13
(e) Exams and tests										2
(f) Other activities:										-
3.4 Total hours of individual study (suma (3.3(a)...3.3(f)))					69					
3.5 Total hours per semester (3.2+3.4)					125					
3.6 Number of credit points					5					

4. Pre-requisites (where appropriate)

4.1 Curriculum	Database
4.2 Competence	

5. Requirements (where appropriate)

5.1. For the course	Board, video projector, computer; student present in mandatory 50% of days for admission to the final exam
5.2. For the applications	Computers, specific software; student present in mandatory 100% of days for admission to the final exam.

6. Specific competence

6.1 Professional competences	C3 - Problems solving using specific Computer Science and Computer Engineering tools (2 credits) • C3.1 - Identifying classes of problems and solving methods that are specific to computing systems • C3.2 - Using interdisciplinary knowledge, solution patterns and tools, making experiments and interpreting their results • C3.3 - Applying solution patterns using specific engineering tools and methods • C3.4 - Comparatively and experimentally evaluation of the alternative solutions for performance optimization • C3.5 - Developing and implementing information system solutions for concrete problems C5 - Designing, managing the lifetime cycle, integrating and ensuring the integrity of hardware, software and communication systems (2 credits) • C5.1 - Specifying the relevant criteria regarding the lifetime cycle, quality, security and the computing system's interaction with the environment and the human operator • C5.2 - Using interdisciplinary knowledge for adapting the computing system to the specific requirements of the application field • C5.3 - Using fundamental principles and methods for ensuring the security, the safety and ease of exploitation of the computing systems • C5.4 - Proper utilization of the quality, safety and security standards in the field of information processing • C5.5 - Creating a project including the problem's identification and analysis, its design and development, also proving an understanding of the basic quality requirements
6.2 Cross competences	N/A

7. Expected Learning Outcomes

Knowledge	Describe, identify and summarize concepts and methods related to database design and applications using databases.
Skills	Choose and explain concepts related to database design. Able to specify requirements, analyze and develop software that uses databases. Designs and implements database systems and integrates them into software applications.
Responsibilities and autonomy	Has an honorable behavior showing responsibility and ethics to maintain professional ethics.

8. Discipline objective (as results from the *key competences gained*)

8.1 General objective	Developing general skills in databases design and database programming
8.2 Specific objectives	Assimilate theoretical knowledge on relational databases design and SQL language extensions Presentation of database transactions Getting practical skills for designing and programming databases

9. Contents

9.1 Lectures		Hours	Teaching methods	Notes
Database Evolution: from SQL to NoSQL (1)		2	PDF & PPT Presentations; Demonstrations and model presentations on board; small exercises to increase interaction.	
Database Evolution: from SQL to NoSQL (2)		2		
SQL Concepts: Queries, Joins, Operations, Functions, Views, Stored procedures (1)		2		
SQL Concepts: Queries, Joins, Operations, Functions, Views, Stored procedures (2)		2		
SQL Concepts: Queries, Joins, Operations, Functions, Views, Stored procedures (3)		2		
SQL Transactions (1)		2		
SQL Transactions (2)		2		
Distributing Databases: Indexing, Partitioning and Replication (1)		2		
Distributing Databases: Indexing, Partitioning and Replication (2)		2		
Distributing Databases: Indexing, Partitioning and Replication (3)		2		
MongoDB Databases		2		
Graph Databases		2		
Consistent Hashing and Apache Cassandra (1)		2		
Consistent Hashing and Apache Cassandra (2)		2		
Bibliography:				
1. Alexandru Leluțiu - <i>Perenitatea Conceptelor Promovate de BAZELE de DATE</i> , Ed. Albastra, 2003				
2. Raghu Ramakrishnan and Johannes Gehrke - <i>Database Management Systems</i> , McGraw-Hill Science, 2002				
3. Rebecca M. Riordan - <i>Designing Relational Database Systems</i> , Microsoft Press, 1999				
4. Matt Shepker - <i>Writing Stored Procedures for Microsoft SQL Server</i> , Sams, 2000				
5. Mark Spenik and Orryn Sledge - <i>Microsoft SQL Server 2000 DBA Survival Guide</i> , Sams, 2001				
9.2 Applications - Seminars / Laboratory / Project		Hours	Teaching methods	Notes
Database and DataBase Management Systems - Microsoft SQL Server		2	Exposure and applications.	Computers, MS SQL Server, PostgreSQL.
Design of Database Structures – Tables, Keys, Relationships		2		
Design of Database Structures – Indexes, Constraints, Views		2		
ETL – Extract Transform Load		2		
Simple Stored Procedures; Functions		2		
Stored Procedures - Cursors		2		
Triggers		2		
Transactions		2		
MS SQL Server administration; Cloud DataBases		2		
MongoDB		2		
MongoDB Applications		2		
MongoDB Applications		2		
NoSQL Databases		2		
Final laboratory evaluation - Final project evaluation		2		
Bibliography:				
1. Alexandru Leluțiu - <i>Perenitatea Conceptelor Promovate de BAZELE de DATE</i> , Ed. Albastra, 2003				
2. Raghu Ramakrishnan and Johannes Gehrke - <i>Database Management Systems</i> , McGraw-Hill Science, 2002				
3. Peter Rob and Carlos Coronel - <i>Database Systems: Design, Implementation, and Management</i> , Crisp Learning, 2006				
4. Matt Shepker - <i>Writing Stored Procedures for Microsoft SQL Server</i> , Sams, 2000				
5. Mark Spenik and Orryn Sledge - <i>Microsoft SQL Server 2000 DBA Survival Guide</i> , Sams, 2001				

*Se vor preciza, după caz: tematica seminariilor, lucrările de laborator, tematica și etapele proiectului.

10. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Database Design is an advanced topic in Computer Engineering and Information Technology field, combining fundamental aspects and practical software tools. Explaining to students the principles of database designing and database programming. Course content it is similar to database courses in other universities in the country and abroad.

11. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	Solving 4 problems and answers to questions of theory	2.5 hours written evaluation face to face or using TEAMS platform, if necessary	50%
Seminar	-	-	-
Laboratory	Implementing an application	Ongoing evaluation	50%
Project	-	-	-

Minimum standard of performance:

Solving practical laboratory work and projects, designing databases and a database programming; solving the problems and other subjects presented at the examination.

Grade calculus: 40% lab + 60% final exam

Conditions for participating in the final exam: Lab ≥ 5

Conditions for promotion: final exam ≥ 5

Date of filling in: 23.04.2026	Responsible	Title First name Last name	Signature
	Course	Lect.dr.eng. Marcel ANTAL	
	Applications	Lect.dr.eng. Călin CENAN	
		Assist.eng. Bogdan BINDEA	

Date of approval in the department	Head of department, Prof.dr.eng. Rodica Potolea
Date of approval in the Faculty Council	Dean, Prof.dr.eng. Vlad Mureșan