COURSE DESCRIPTION

Database Management Systems

Academic year 2025-2026

1. Programme-related data

1.1. Higher Education Institution	Babeş Bolyai University, Cluj-Napoca
1.2. Faculty	Faculty of Mathematics and Computer Science
1.3. Department	Department of Computer Science
1.4. Field	Computer Science
1.5. Level of study	Bachelor
1.6. Degree programme / Qualification	Computer Science
1.7. Form of education	Full-time

2. Course-related data

2.1. Course title	**Database Management Systems**			Course code	**MLE5028**
2.2. Course coordinator	Lect. dr. Sabina Surdu				
2.3. Seminar coordinator	Lect. dr. Sabina Surdu				
2.4. Year of study	2	2.5. Semester	4	2.6. Type of assessment	Viva voce
2.7. Course status	Compulsory			2.8. Course type	Specialisation subject

3. Total estimated time (hours per semester of teaching activities)

3.1. Number of hours per week	**4**	of which: 3.2. course	**2**	3.3. seminar/ laboratory/ project	**2**
3.4. Total of hours in the curriculum	56	of which: 3.5. course	28	3.6. seminar/ laboratory	**28**
Time allocation for individual study (IS) and self-taught activities (ST)					**hours**
Learning from textbooks, course materials, bibliography, and notes (IS)					25
Additional research in the library, on subject-specific electronic platforms, and on-site					15
Preparing seminars/ laboratories/ projects, assignments, reports, portfolios, and essays					25
Tutoring (professional guidance)					11
Examinations					18
Other activities					
3.7. Total hours of individual study (IS) and self-taught activities (ST)				**94**	
3.8. Total hours per semester				**150**	
3.9. Number of credits				**6**	

4. Prerequisites (where applicable)

4.1. curriculum-related	Data Structures and Algorithms Databases
4.2 skills-related	Intermediate programming skills in a high-level programming language

5. Specific conditions (where applicable)

5.1. course-related	Lecture room equipped with a video projector
5.2. seminar/laboratory-related	Computer lab with SQL Server and Visual Studio

6.1. Competencies resulting from the completion of the degree programme *(as referred to in the curriculum)*[1]

[1] The professional and/or transversal skills targeted by the subject for which the course description is prepared will be copied from the curriculum of the degree programme. For each competency, the complete entry, including the competency code, will be copied with the exact wording that appears in the curriculum, without any changes. If no competency is copied from either of the two categories, the row corresponding to that category is deleted from the table.

Professional competencies	
Competency code	**Competency**
PC16	Create database diagrams
PC17	Manage databases
PC18	Design database schema
PC19	Create data models
Transversal competencies	
Competency code	**Competency**
TC2	Solve problems
TC3	Think analytically

6.2. Learning outcomes relevant to the degree programme (as referred to in the curriculum)[2]

Learning outcomes targeted by the subject		
Competency code	**Knowledge and comprehension**	**Specific academic skills**
PC16 **PC17** **PC20** **PC21**	*The student/graduate describes, identifies and explains the functioning and administration of computer networks and operating systems.*	*The student/graduate designs, applies, operates and develops relational databases.*
PC18 **PC19**	*The student/graduate identifies, selects and justifies database design principles and models.*	*The student/graduate designs, builds and develops databases and database systems.*
TC2 **TC3**	*The student/graduate has the knowledge necessary to understand and solve complex problems, and to plan and organize advanced processes in various fields.*	*The graduate is able to identify complex problems and examine related issues to develop solving options and implement solutions.* *The graduate has the ability to apply general rules to specific problems and produce relevant solutions.* *The graduate is able to combine diverse information to formulate solutions and generate ideas for developing new products and applications.*

7. Subject-specific learning outcomes

Knowledge and comprehension
1. To become familiar with the fundamental concepts of concurrency control and database recovery
2. To become familiar with the fundamental concepts of query optimization
3. To become familiar with the fundamental concepts of distributed databases and parallel databases
4. To become familiar with the fundamental concepts of database security

[2] The learning outcomes relevant for the degree programme and targeted by the subject for which the course description is prepared will be listed. The entries, copied without any changes from the Curriculum by subject type (Core Subject/Specialisation Subject/Complementary Subject), are listed under the corresponding competency.

Specific academic skills
1. To create ADO.NET applications with data-bound controls
2. To manage concurrent transactions using pessimistic and optimistic concurrency control mechanisms
3. To optimize SQL queries

8. Contents

8.1. Course	Teaching and learning methods	Remarks[3]
1-3. Introduction. Transactions and Concurrency Control	Interactive presentation Discussion Examples Problem-solving Explanation	
4. Database Recovery	Interactive presentation Discussion Examples Problem-solving Explanation	
5. Database Security	Interactive presentation Discussion Examples Problem-solving Explanation	
6-9. Evaluating Relational Operators. Query Optimization	Interactive presentation Discussion Examples Problem-solving Explanation	
10-11. Distributed Databases	Interactive presentation Discussion Examples Problem-solving Explanation	
12. Data Stream Processing: Azure Stream Analytics, Azure Machine Learning	Interactive presentation Discussion Examples Problem-solving Explanation	
13. Parallel Databases. Spatial Databases	Interactive presentation Discussion Examples Problem-solving Explanation	
14. Problems	Interactive presentation Discussion Examples Problem-solving Explanation	
Bibliography DATE, C.J., An Introduction to Database Systems (8th Edition), Addison-Wesley, 2003 GARCIA-MOLINA, H., ULLMAN, J., WIDOM, J., Database Systems: The Complete Book (2nd Edition), Pearson Education, 2009		

[3] For example, organisational aspects, recommendations for students, specific aspects relating to the course/seminar, such as inviting experts in the field, etc.

KNUTH, D.E., Tratat de programare a calculatoarelor. Algoritmi fundamentali, Editura Tehnică, Bucureşti, 1974

KNUTH, D.E., Tratat de programare a calculatoarelor. Sortare şi căutare, Editura Tehnică, Bucureşti, 1976

LEVENE, M., LOIZOU, G., A Guided Tour of Relational Databases and Beyond, Springer, 1999

LITCHFIELD, D., ANLEY, C., HEASMAN, J., GRINDLAY, B., The Database Hacker's Handbook: Defending Database Servers, John Wiley & Sons, 2005

LIU, L., OZSU, M.T., Encyclopedia of Database Systems, Springer, 2009

RAMAKRISHNAN, R., GEHRKE, J., Database Management Systems (3rd Edition), McGraw-Hill, 2002

SILBERSCHATZ, A., KORTH, H., SUDARSHAN, S., Database System Concepts (7th Edition), McGraw-Hill, 2019

ŢÂMBULEA, L., Curs Baze de date, Facultatea de Matematică şi Informatică, UBB, versiunea 2013-2014

ŢÂMBULEA, L., Baze de date, Litografiat, Cluj-Napoca, 2003

ULLMAN, J., WIDOM, J., A First Course in Database Systems, http://infolab.stanford.edu/~ullman/fcdb.html

*** Azure Stream Analytics - technical documentation, https://azure.microsoft.com/en-us/services/stream-analytics/

*** Azure Machine Learning - technical documentation, https://azure.microsoft.com/en-us/services/machine-learning/

8.2. Seminar/ laboratory	**Teaching and learning methods**	**Remarks**
Seminar		
1. ADO.NET (I)	Discussion Problem-solving Examples Explanation	
2. ADO.NET (II)	Discussion Problem-solving Examples Explanation	
3. Transactions and Concurrency Control	Discussion Problem-solving Examples Explanation	
4. Multiversion Concurrency Control	Discussion Problem-solving Examples Explanation	
5. Performance Tuning in SQL Server (I)	Discussion Problem-solving Examples Explanation	
6. Problems	Discussion Problem-solving Examples Explanation	
7. Performance Tuning in SQL Server (II)	Discussion Problem-solving Examples Explanation	
Laboratory		

1. Windows Forms application using ADO.NET to interact with a SQL Server database	Discussion Problem-solving Examples Explanation	
2. Generic Windows Forms application - configuration file	Discussion Problem-solving Examples Explanation	
3. Concurrency control	Discussion Problem-solving Examples Explanation	
Bibliography Course bibliography		

9. Evaluation

Type of activity	9.1 Evaluation criteria[4]	9.2 Evaluation methods[5]	9.3 Percentage in the final grade
9.4. Course	• to understand and apply the concepts presented in the course • to solve problems	• written exam	50%
9.5. Seminar/ laboratory	• to apply the concepts from the course and seminar in order to develop database applications and manage concurrent transactions	• lab evaluation • practical exam	50%
9.6 Minimum standard for passing			
• To pass, a student must obtain a grade of at least 5 (on a scale from 1 to 10) in the written exam, practical exam, and lab evaluation. • To be eligible to take the exam, a student must have attended at least 6 laboratory classes and at least 5 seminar classes, according to the Decision of the Computer Science Department: https://www.cs.ubbcluj.ro/wp-content/uploads/Hotarare-CDI-29.04.2020.pdf.			

10. SDG labels (Sustainable Development Goals)[6]

	○	Sustainable Development Generic Label

[4] The evaluation criteria must directly reflect the learning outcomes targeted at the level of the degree programme respectively at the level of the subject. More specifically, the learning outcomes set out in the expected learning outcomes are assessed.

[5] Both final evaluation methods and ongoing evaluation strategies should be established.

[6] Select a single label which, according to the *Implementation of SDG labels in the academic process*, best matches the subject. If the subject addresses sustainable development in a generic manner (i.e. by presenting/introducing the general framework of sustainable development, etc.), then the Sustainable Development generic label may be applied. If none of the labels describe the subject, select the last option: *"No label applies."*

								●
								No label applies

Date of entry:
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Signature of course coordinator

Lect. dr. Sabina Surdu

Signature of seminar coordinator

Lect. dr. Sabina Surdu

Date of approval in the department:
...

Signature of the head of department

Conf. dr. Adrian Sterca