

## SYLLABUS

### 1. Information regarding the programme

1.1 Higher education institution	<b>Babeş Bolyai University, Cluj-Napoca</b>
1.2 Faculty	<b>Faculty of Mathematics and Computer Science</b>
1.3 Department	<b>Department of Computer Science</b>
1.4 Field of study	<b>Computer Science</b>
1.5 Study cycle	<b>Bachelor</b>
1.6 Study programme / Qualification	<b>Computer Science</b>

### 2. Information regarding the discipline

2.1 Name of the discipline	<b>Databases</b>						
2.2 Course coordinator	<b>Lect. Dr. Sabina Surdu</b>						
2.3 Seminar coordinator	<b>Lect. Dr. Sabina Surdu</b>						
2.4. Year of study	<b>2</b>	2.5 Semester	<b>3</b>	2.6. Type of evaluation	<b>E</b>	2.7 Type of discipline	<b>Compulsory</b>
2.8. Code of the discipline	MLE5027						

### 3. Total estimated time (hours/semester of didactic activities)

3.1 Hours per week	5	Of which: 3.2 course	2	3.3 seminar/laboratory	3
3.4 Total hours in the curriculum	70	Of which: 3.5 course	28	3.6 seminar/laboratory	42
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					21
Additional documentation (in libraries, on electronic platforms, field documentation)					15
Preparation for seminars/labs, homework, papers, portfolios and essays					25
Tutorship					11
Evaluations					8
Other activities: .....					
3.7 Total individual study hours	80				
3.8 Total hours per semester	150				
3.9 Number of ECTS credits	6				

### 4. Prerequisites (if necessary)

4.1. curriculum	Data Structures and Algorithms
4.2. competencies	Average programming skills in a high level programming language

### 5. Conditions (if necessary)

5.1. for the course	Lecture room with a video projector
5.2. for the seminar /lab	Lab room with SQL Server, Visual Studio

activities	
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## 6. Specific competencies acquired

<b>Professional competencies</b>	<p>C 5.1 Identifying basic concepts for data organization in databases</p> <p>C 5.2 Identifying and explaining basic models for data organization and management in databases</p> <p>C 5.3 Using methodologies and database design environments for specific problems</p> <p>C 5.4 Evaluating the quality of various Database Management Systems in terms of their structure, functionality and extensibility</p> <p>C 5.5 Developing projects involving databases</p>
<b>Transversal competencies</b>	<p>CT1 - Applying organized and efficient work rules, responsible attitudes towards the didactic and scientific field, in order to creatively capitalize on one's own potential, while respecting the professional ethics principles and rules</p> <p>CT3 - Use efficient methods and techniques for learning, knowledge gaining, researching and developing abilities for knowledge capitalization and accommodation to the requirements of a dynamic society</p>

## 7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	<ul style="list-style-type: none"> <li>To get acquainted with the fundamental concepts concerning databases</li> <li>To gain a thorough understanding of the relational data model</li> </ul>
7.2 Specific objective of the discipline	<ul style="list-style-type: none"> <li>To manage (to create, to modify) relational databases in SQL Server</li> <li>To analyze data using complex SQL queries</li> <li>To optimize SQL queries</li> </ul>

## 8. Content

8.1 Course	Teaching methods	Remarks
<b>1. Introduction to Databases</b>	Interactive presentation Conversation Examples Explanation	
<b>2. The Relational Data Model</b>	Interactive presentation Conversation Examples Explanation	
<b>3. SQL Queries</b>	Interactive presentation Conversation Examples Explanation	
<b>4-5. Functional Dependencies, Normal Forms</b>	Interactive presentation	

	Conversation Examples Explanation	
<b>6. The Relational Algebra</b>	Interactive presentation Conversation Examples Explanation	
<b>7. The Physical Structure of Databases</b>	Interactive presentation Conversation Examples Explanation	
<b>8-10. Indexes. Trees. Hash files</b>	Interactive presentation Conversation Examples Explanation	
<b>11. Evaluating the Relational Algebra Operators</b>	Interactive presentation Conversation Examples Explanation	
<b>12. Conceptual Modeling</b>	Interactive presentation Conversation Examples Explanation	
<b>13. Data Streams</b>	Interactive presentation Conversation Examples Explanation	
<b>14. Problems</b>	Interactive presentation Conversation Examples Explanation	
<b>Bibliography</b> ABADI, D.J., CARNEY, D., CETINTEMEL, U., CHERNIACK, M., CONVEY, C., LEE, S., STONEBRAKER, M., TATBUL, N., ZDONIK, S.B., Aurora: A New Model and Architecture for Data Stream Management, The VLDB Journal, 12(2):120–139, 2003  ARASU, A., BABCOCK, B., BABU, S., DATAR, M., ITO, K., MOTWANI, R., NISHIZAWA, I., SRIVASTAVA, U., THOMAS, D., VARMA, R., WIDOM, J., STREAM: The Stanford Stream Data Manager, IEEE Data Engineering Bulletin 26(1): 19-26, 2003  ARASU, A., CHERNIACK, M., GALVEZ, E., MAIER, D., MASKEY, A.S., RYVKINA, E., STONEBRAKER, M., TIBBETTS, R., Linear Road: A Stream Data Management Benchmark, Proceedings of The Thirtieth International Conference on Very Large Data Bases (VLDB 2004), 480-491, 2004  DATE, C.J., An Introduction to Database Systems (8th Edition), Addison-Wesley, 2003		

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GRIPAY, Y., LAFOREST, F., LESUEUR, F., LUMINEAU, N., PETIT, J.-M., SCUTURICI, V.-M., SEBAHI, S., SURDU, S., ColisTrack: Testbed for a Pervasive Environment Management System, Proceedings of The 15th International Conference on Extending Database Technology (EDBT 2012), 574-577, 2012

KNUTH, D.E., Tratat de programare a calculatoarelor. Sortare și căutare, Editura Tehnică, București, 1976

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

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 (6th Edition), McGraw-Hill, 2011

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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/>

<b>8.2 Seminar / laboratory</b>	Teaching methods	Remarks
<b>Seminar</b>		
<b>1. SQL - Data Definition Language</b>	Conversation Problems Examples Explanation	
<b>2. SQL - Data Manipulation Language</b>	Conversation Problems Examples Explanation	
<b>3. Stored Procedures, Dynamic SQL, Cursors</b>	Conversation Problems Examples Explanation	
<b>4. Functions, Views, Triggers</b>	Conversation Problems Examples Explanation	
<b>5. Indexes (I)</b>	Conversation Problems Examples Explanation	
<b>6. Indexes (II)</b>	Conversation Problems Examples Explanation	

<b>7. Problems</b>	Conversation Problems Examples Explanation	
<b>Laboratory</b>		
<b>1. Database Design</b>	Conversation Problems Examples Explanation	
<b>2. SQL Queries</b>	Conversation Problems Examples Explanation	
<b>3. Altering the Database</b>	Conversation Problems Examples Explanation	
<b>4. Database Testing</b>	Conversation Problems Examples Explanation	
<b>5. Indexes</b>	Conversation Problems Examples Explanation	
<b>Bibliography</b> Course bibliography		

**9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program**

<ul style="list-style-type: none"> <li>• The course is oriented towards the problems a graduate student should solve at his / her future workplace. The acquired knowledge is considered as mandatory by software companies.</li> <li>• The course is part of the academic curriculum of all major universities in Romania and abroad.</li> <li>• The course structure follows the IEEE and ACM Recommendations concerning the Computer Science curriculum.</li> </ul>
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**10. Evaluation**

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	<ul style="list-style-type: none"> <li>• to know and apply the concepts described at the course</li> <li>• to solve problems</li> </ul>	<ul style="list-style-type: none"> <li>• written exam</li> </ul>	50%
10.5 Seminar/lab activities	<ul style="list-style-type: none"> <li>• to be able to apply the concepts from the course and seminar to design / alter a database, to analyze data with SQL queries, to optimize queries</li> </ul>	<ul style="list-style-type: none"> <li>• lab evaluation</li> <li>• practical exam</li> </ul>	50%
10.6 Minimum performance standards			
➤ To pass, a student must get a grade of at least 5 (on a scale of 1 to 10) on the written exam, practical exam			

and lab evaluation.

- To attend the exam, a student must have at least 12 laboratory attendances and at least 5 seminar attendances, according to the Computer Science Department's decision: <http://www.cs.ubbcluj.ro/wp-content/uploads/Hotarare-CDI-15.03.2017.pdf>.

Date

Signature of course coordinator

Signature of seminar coordinator

02.05.2020

Lect. Dr. Sabina Surdu

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Date of approval

Signature of the head of department

Prof. Dr. Anca Andreica