SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	**Babeș Bolyai University, Cluj Napoca**
1.2 Faculty	**Faculty of Mathematics and Computer Science**
1.3 Department	**Department of Computer Science**
1.4 Field of study	**Computer Science**
1.5 Study cycle	**Bachelor**
1.6 Study programme / Qualification	**Artificial Intelligence**

2. Information regarding the discipline

2.1 Name of the discipline			**Databases**				
2.2 Course coordinator			**Lect. PhD. Emilia-Loredana Pop**				
2.3 Seminar coordinator			**Lect. PhD. Emilia-Loredana Pop**				
2.4. Year of study	**2**	2.5 Semester	**3**	2.6. Type of evaluation	**E**	2.7 Type of discipline	**Compulsory**
2.8 Code of the discipline		MLE5027					

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

3.1 Hours per week	4	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					15
Additional documentation (in libraries, on electronic platforms, field documentation)					12
Preparation for seminars/labs, homework, papers, portfolios and essays					12
Tutorship					8
Evaluations					8
Other activities:					

3.7 Total individual study hours	55
3.8 Total hours per semester	125
3.9 Number of ECTS credits	5

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 activities	Lab room with SQL Server, Visual Studio

6. Specific competencies acquired

Professional competencies	C 5.1 Identifying basic concepts for data organization in databases C 5.2 Identifying and explaining basic models for data organization and management in databases C 5.3 Using methodologies and database design environments for specific problems C 5.4 Evaluating the quality of various Database Management Systems in terms of their structure, functionality and extensibility C 5.5 Developing projects involving databases
Transversal competencies	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 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

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

7.1 General objective of the discipline	• To get acquainted with the fundamental concepts concerning databases • To gain a thorough understanding of the relational data model
7.2 Specific objective of the discipline	• To manage (create, modify, remove) relational databases in SQL Server • To analyze data using complex SQL queries • To optimize SQL queries

8. Content

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

	Conversation Examples Explanation	
6. The Relational Algebra	Interactive presentation Conversation Examples Explanation	
7. The Physical Structure of Databases	Interactive presentation Conversation Examples Explanation	
8-9. Indexes. Trees. Hash files	Interactive presentation Conversation Examples Explanation	
10. Evaluating the Relational Algebra Operators	Interactive presentation Conversation Examples Explanation	
11. Conceptual Modeling	Interactive presentation Conversation Examples Explanation	
12. Object Oriented Databases, Data Streams	Interactive presentation Conversation Examples Explanation	
13. Transactions, Concurrency Control	Interactive presentation Conversation Examples Explanation	
14. Problems	Interactive presentation Conversation Examples Explanation	

Bibliography

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., STONEBREAKER, 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

BAGUI, S., EARP, R., Database Design Using Entity-Relationship Diagrams (Foundations of Database

Design) – 2nd edition, CRC Press, Taylor & Francis Group, 2011

CAPTAIN, F.A., Six-Step Relational Database Design: A step by step approach to relational database design and development – 2nd edition, Createspace Independent Publishing Platform, 2013

CHURCHER, C., Beginning Database Design – From Novice to Professional, Apress, 2007

CORONEL, C., MORRIS, S., Database Systems Design, Implementation, and Management, Cengage Learning, 2016

DATE, C.J., An Introduction to Database Systems (8th Edition), Addison-Wesley, 2003

DATE, C.J., Database Design and Relational Theory: Normal Forms and All That Jazz – 2nd edition, Apress, 2019

DAVIDSON, L., MOSS, J., Pro SQL Server Relational Database Design and Implementation, Best Practices for Scalability and Performance. Apress, 2021

DEBARROS, A., Practical SQL: A Beginner's Guide to Storytelling with Data, Estadisticos e-Books & Paper, 2018

GARCIA-MOLINA, H., ULLMAN, J., WIDOM, J., Database Systems: The Complete Book (2nd Edition), Pearson Education, 2009

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

HALPIN, T. A., MORGAN, T., Information modeling and Relational Databases – 2nd edition, Burlington, MA: Morgan Kaufmann Publishers, 2008

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

OPPEL, A.J., Databases A Beginner's Guide, McGraw-Hill Education, 2009

PETKOVIC, D., Microsoft SQL Server 2019: A Beginner's Guide – 7th edition, McGraw-Hill, 2019

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

SHIELD, W., SQL QuickStart Guide: The Simplified Beginner's Guide to Managing, Analyzing, and Manipulating Data with SQL, ClydeBank Media, 2019

ȚÂMBULEA, L., Curs Baze de date, Facultatea de Matematică și Informatică, UBB, versiunea 2013-2014

ȚÂMBULEA, 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/

8.2 Seminar / laboratory	Teaching methods	Remarks
Seminar	Problems solving	
1. SQL - Data Definition Language	Conversation Problems Examples Explanation	
2. SQL - Data Manipulation Language	Conversation Problems Examples Explanation	
3. Stored Procedures, Dynamic SQL, Cursors	Conversation Problems Examples Explanation	
4. Functions, Views, Triggers	Conversation Problems Examples Explanation	
5. Indexes (I)	Conversation Problems Examples Explanation	
6. Indexes (II)	Conversation Problems Examples Explanation	
7. Problems	Conversation Problems Examples Explanation	
Laboratory	Teaching programs in which real life problems can be solved	
1-3. Database Design	Conversation Problems Examples Explanation	
3-6. SQL Queries	Conversation Problems Examples Explanation	
6-8. Altering the Database	Conversation Problems Examples	

	Explanation	
8-11. Database Testing	Conversation Problems Examples Explanation	
11-14. Indexes	Conversation Problems Examples Explanation	
Bibliography 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

- 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.
- The course is part of the academic curriculum of all major universities in Romania and abroad.
- The course structure follows the IEEE and ACM Recommendations concerning the Computer Science curriculum.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	• to know and apply the concepts described at the course	• written exam	50%
	• to solve Databases problems		
10.5 Seminar/lab activities	• 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	• lab evaluation	25%
		• practical exam	25%
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 6 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
24.04.2024	Lect. PhD. Emilia-Loredana Pop	Lect. PhD. Emilia-Loredana Pop

Date of approval

Signature of the head of department

Assoc. Prof. PhD. Adrian Ioan Sterca