SYLLABUS

1. Information regarding the programme

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 of study	**Computer Science**
1.5 Study cycle	**Bachelor**
1.6 Study programme / Qualification	**Computer Science**

2. Information regarding the discipline

2.1 Name of the discipline	**Spatial Databases**						
2.2 Course coordinator	Lecturer PhD. TRÎMBIŢAŞ Maria-Gabriela						
2.3 Seminar coordinator	Lecturer PhD. TRÎMBIŢAŞ Maria-Gabriela						
2.4. Year of study	**3**	2.5 Semester	**5**	2.6. Type of evaluation	**C**	2.7 Type of discipline	**Optional**

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

3.1 Hours per week	3	Of which: 3.2 course	2	3.3 seminar/laboratory	1/1
3.4 Total hours in the curriculum	42	Of which: 3.5 course	28	3.6 seminar/laboratory	14
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					14
Additional documentation (in libraries, on electronic platforms, field documentation)					8
Preparation for seminars/labs, homework, papers, portfolios and essays					14
Tutorship					14
Evaluations					8
Other activities:					0

3.7 Total individual study hours	58
3.8 Total hours per semester	100
3.9 Number of ECTS credits	4

4. Prerequisites (if necessary)

4.1. curriculum	• Databases • Data Structures and Algorithms
4.2. competencies	• Ability to create databases

5. Conditions (if necessary)

5.1. for the course	• Lecture room with video projector
5.2. for the seminar /lab activities	• Laboratory with computers with MS SQL Server (minimum 2008) installed

6. Specific competencies acquired

Professional competencies	C3.1 Description of concepts, theories and models used in the application domain C3.3 Use of mathematical and computer science models and tools for solving problems in the application domain C3.4 Data and models analysis C3.5 Development of computer components for interdisciplinary projects
Transversal competencies	**CT1** Apply rules to: organized and efficient work, responsibilities of didactical and scientific activities and creative capitalization of own potential, while respecting principles and rules for professional ethics **CT3** Use of effective methods and techniques of learning, information, research and development of the capacity to exploit knowledge, to adapt to the requirements of a dynamic society and communication in Romanian language and in a foreign language

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

7.1 General objective of the discipline	• To initiate the students into spatial database problems and concepts • To induce practical skills for working with spatial databases and data structures
7.2 Specific objective of the discipline	• To understand the concept of spatial databases • Learn about the components of SDBMS • To understand the concept of a query language; improve the skills in using a standard query language (SQL) • Learn to use spatial ADTs with SQL • Learn to use OGIS spatial ADTs with SQL

8. Content

8.1 Course	Teaching methods	Remarks
1. What is a Spatial Database System (SDBMS)? Terms, Definitions Modeling Spatial Data in Traditional DBMS	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
2. Spatial Data Types and Traditional Databases Spatial Data Types and Post-relational Databases **How is a SDBMS different from a GIS ?** Components of a SDBMS	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
3. Three Layer Architecture Spatial Taxonomy Data Models	• Interactive exposure • Explanation • Conversation • Didactical demonstration	

4. Spatial Concepts and Data Models What is a Data Model? Types of Data Models Models of Spatial Information	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
5. Field based Model Types of Field Operations Object Model	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
6. Classifying Spatial objects Spatial Object Types in OGIS Data Model Classifying Operations on spatial objects in Object Model Topological Relationships	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
7. Three-Step Database Design Extending ER with Spatial Concepts Conceptual Data Modeling with UML Comparing UML Class Diagrams to ER Diagrams	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
8. Spatial Query Languages Standard Database Query Languages Relational Algebra Basic SQL Primer	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
9. Query Processing, Query Optimization	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
10. Extending SQL for Spatial Data Example Queries that emphasize spatial aspects Trends: Object-Relational SQL	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
11. Spatial Storage and Indexing Storage: Disk and Files Organizing spatial data with space filling curves Grid Files R-tree family	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
12. Spatial Indexing: Search Data-Structures	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
13. Trends in Spatial Databases	• Interactive exposure • Conversation	
14. Graded paper in Spatial Databases	• Written test	

Bibliography

1. SHASHI SHEKHAR, SANJAY CHAWLA , Spatial Databases: A Tour , Prentice Hall, 2003 (ISBN 013-017480-7)
2.MANFRED M. FISCHER, PETER NIJKAMP - Geographic Information Systems, Spatial Modeling and Policy Evaluation, Springer-Verlag GmbH (1993)
3. EMMANUEL STEFANAKIS - Geographic Databases and GIS 2008, Hardcover., ISBN: 978-3-540-22491-4
4. GABRIEL M KUPER, LEONID LIBKIN, JAN PAREDAENS (Editors) - Constraint Databases. Springer 2000, ISBN 3-540-66151-4
5. Applications of Spatial Data Structures: Computer Graphics, Image Processing and GIS (Addison-Wesley series in computer science) (Hardcover), 1989
6. https://www.kth.se/social/upload/5177f0ecf2765405c1346b84/AG2425_Spatial_Databases.pdf, Rui Zhu and Gyözö Gidófalvi, Last Updated: March 18, 2013

8.2 Seminar / laboratory	Teaching methods	Remarks
I. Getting Started With Microsoft SQL Server 2008 Spatial	Explanation, dialogue, case studies	The laboratory is structured as 2 hours classes every second week
II. Spatial Data types in Microsoft SQL Server 2008: Geometry and Geography	Explanation, dialogue, case studies	
III. Design of a Spatial DB	Explanation, dialogue, case studies	
IV. Implementation of SDB	Explanation, dialogue, case studies	
V. Querying a SDB I	Explanation, dialogue, case studies	
VI. Querying a SDB II	Explanation, dialogue, case studies	
VII. Presentation of the personal project		

Bibliography

SERGE ABITEBOUL , RICHARD HULL , VICTOR VIANU **Foundations of Databases** *Addison-Wesley, 1995*
MARK DE BERG, OTFRIED CHEONG, MARC VAN KREVELD, MARK OVERMARS,Computational Geometry: Algorithms and Applications Springer, Berlin, 2008.

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 respects the IEEE and ACM Curricula Recommendations for Computer Science studies;
- The course exists in the studying program of major universities in Europe and abroad;
- The content of the course is concordant with partial competencies for possible occupations from the Grid 1 - RNCIS

10. Evaluation

Type of activity	Evaluation criteria	Evaluation methods	Share in the grade (%)
Course	• know the basic principle of the domain; • apply the course concepts • problem solving	Written test	50%
	• be able to design and implement a spatial database • apply techniques for different classes of real world problems •	Continuous observations Practical project	50%
Minimum performance standards			
• The final grade (average between written exam and laboratory work) should be at least grade 5 (from a scale of 1 to 10)			

Date	Signature of course coordinator	Signature of seminar coordinator
27.05.2016	Lect. PhD. Maria-Gabriela Trîmbiţaş	Lect. PhD. Maria-Gabriela Trîmbiţaş

Date of approval

Signature of the head of department

Prof. Dr. Anca Andreica