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	**Compulsory**

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 lab
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					23
Additional documentation (in libraries, on electronic platforms, field documentation)					13
Preparation for seminars/labs, homework, papers, portfolios and essays					23
Tutorship					4
Evaluations					20
Other activities:					-

3.7 Total individual study hours	83
3.8 Total hours per semester	125
3.9 Number of ECTS credits	5

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	• Use knowledge of database paradigms to model and solve various real-world problems • Good database design and programming skills • Ability to work independently and/or in a team in order to solve problems in defined professional contexts
Transversal competencies	• Execution of the tasks under specified requirements and the deadlines imposed, according to professional ethics and moral conduct • Manage tasks according to the generally established objectives • Concern for improving the results of professional activity by personal involvement in the activities

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 struktures
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	Exposure: description, explanation, examples, debate, dialogue	
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	Exposure: description, explanation, examples, debate, dialogue	
3. Three Layer Architecture Spatial Taxonomy Data Models	Exposure: description, explanation, examples, debate, dialogue	
4. Spatial Concepts and Data Models What is a Data Model? Types of Data Models Models of Spatial Information	Exposure: description, explanation, examples, debate, dialogue	

5. Field based Model Types of Field Operations Object Model	Exposure: description, explanation, examples, debate, dialogue	
6. Classifying Spatial objects Spatial Object Types in OGIS Data Model Classifying Operations on spatial objects in Object Model Topological Relationships	Exposure: description, explanation, examples, debate, dialogue	
7. Three-Step Database Design Extending ER with Spatial Concepts Conceptual Data Modeling with UML Comparing UML Class Diagrams to ER Diagrams	Exposure: description, explanation, examples, debate, dialogue	
8. Spatial Query Languages Standard Database Query Languages Relational Algebra Basic SQL Primer	Exposure: description, explanation, examples, debate, dialogue	
9. Query Processing, Query Optimization	Exposure: description, explanation, examples, debate, dialogue	
10. Extending SQL for Spatial Data Example Queries that emphasize spatial aspects Trends: Object-Relational SQL	Exposure: description, explanation, examples, debate, dialogue	
11. Spatial Storage and Indexing Storage:Disk and Files Organizing spatial data with space filling curves Grid Files R-tree family	Exposure: description, explanation, examples, debate, dialogue	
12. Spatial Indexing: Search Data-Structures	Exposure: description, explanation, examples, debate, dialogue	
13. Trends in Spatial Databases	Exposure: description, debate, dialogue	
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 Modelling 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

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 Datatypes 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 Curriculla 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	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	- know the basic principle of the domain; - apply the course concepts - problem solving	Written test	50%
10.5 Seminar/lab activities	- be able to design and implement a spatial database - apply techniques for different classes of real world problems	Continuous observations Practical project	50%

10.6 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
19.01.2014	Lect. PhD. Maria-Gabriela Trîmbiţaş	Lect. PhD. Maria-Gabriela Trîmbiţaş

Date of approval	Signature of the head of department
.....	Prof. Dr. Bazil Pârv