COURSE OUTLINE

1. Study programme information

1.1 Higher education institution	Universitatea de Vest din Timişoara
1.2 Faculty / Department	Chimie, Biologie, Geografie / Departamentul de Geografie
1.3 Sub-department	Geografie
1.4 Field of study	Geography
1.5 Level of study	Master's degree
1.6 Study programme / Qualification	Geographic Information Systems

2. Course information

2.1 Course title				**Introduction to databases**			
2.2 Course convenor/ Lecturer				Drd. Ing. Ion- Alexandru Meca			
2.3 Teaching assistant				Drd. Ing. Ion- Alexandru Meca			
2.4 Year of study	I	2.5 Semester	1	2.6 Type of assessment	E	2.7 Course type	DS/DO

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

3.1 Number of hours per week	3	of which: 3.2 lecture	1	3.3 seminar/laboratory	2
3.4 Total hours in the curriculum	42	of which: 3.5 lecture	14	3.6 seminar/laboratory	28
Time distribution:					**hours**
Studying textbooks, course materials, bibliography and notes					35
Further research in libraries, on electronic platforms and in the field					35
Preparing seminars/ laboratories, homework, research papers, portfolios and essays					20
Tutoring					9
Examinations					9
Other activities ……					

3.7 Total hours of individual study	**108**
3.8 Total hours per semester	**150**
3.9 Number of credits	**6**

4. Prerequisites (if applicable)

4.1 based on curriculum	Programming Languages
4.2 based on competencies	Proficiency in English, Analytical mindset, Ability to decompose complex problems into sub-problems

5. Conditions (if applicable)

5.1 for the course	• Room equipped with beamer and whiteboard
5.2 for the seminar/laboratory	• Room equipped with computers running PostgreSQL Developer tool and available connectivity to an PostgreSQL Database server including PostGIS

6. Objectives of the discipline - expected learning outcomes to the formation of which contribute to the completion and promotion of the discipline

Knowledges	• Good understanding of relational database approach; • Good knowledge of techniques and methodologies specific to relational database design • Basic understanding of Spatial database systems • Basic understanding of Spatial datastores. • Knowledge in relational database design and efficient implementation • Argue about advantages and shortcomings of different model used in modern database management systems
Skills	• Ability to approach a problem using a relational database approach • Ability to manage relational data (query, insert, update, delete) using SQL language • Ability to handle security issues for relational database management systems (users, roles, permissions) • Ability to analyse, design and implement simple and moderate complexity use cases using computer-based models (database approach) • Ability to express high-level, human specific questions into machine-specific languages • Use SQL language to represent end-users queries against relational databases
Responsibility and autonomy	• Development of a critical and analytical spirit among students; appreciating the advantages of using algorithmic thinking • The ability to solve specific tasks autonomously • The application of effective and responsible work strategies, based on the principles, norms and values of the code of professional ethics • Application of effective work techniques in a multidisciplinary team, ethical attitude, respect for diversity and multiculturalism, acceptance of diversity of opinion • Self-assessment of the need for continuous professional training for the purpose of insertion and adaptability to the requirements of the labor market

7. Content

7.1 Lecture	**Teaching methods**	**Observations**
C1. Basic concepts of database approach. Roles. Components of database system (1h)	Lecture, Interactive presentations, heuristic conversation, problematization	Lecture notes: Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition) – Chapter 1
C2. The database environment (1h)		Lecture notes : Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition) – Chapter 2
C3. Conceptual, logical and physical design of databases (1h)		Lecture notes: Thomas Connolly and Carolyn Begg, Database Systems – A Practical Approach to Design, Implementation, and Management (4th edition) – Chapter 11/12
C4. The relational model. Basic concepts. Relational integrity (1h)		Lecture notes: Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition)

		– Chapter 3
C5. The relational model. Relational algebra. Codd rules. SQL as an implementation of relational model (1h)		Lecture notes: Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition) – Chapter 4
C6. Normalization process. Functional dependencies. Normal forms 1NF, 2NF, 3NF (1h)		Lecture notes: Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition) – Chapter 13
C7. Normalization process. Normal forms BCNF, 4NF and 5NF. Multi- valued dependencies (1h)		Lecture notes: Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition) – Chapter 14
C8. Indexes. Role. Utilization. Implementation (1h)		Lecture notes: Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition) – Chapter 17, Annex C5
C9. Concurrency in relational database systems. Anomalies. Transactions. Isolation levels. (1h)		Lecture notes: Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition – Chapter 6.5 and 20
C10. Triggers and views (1h)		Lecture notes: Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition) – Chapter 8.2.7, 6.4, 3.4
C11. A practical use-case to illustrate the database modelling process (1h)		Lecture notes: Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition) – Chapters 15, 16, 17
C12. Introduction to Spatial Database. Spatial Data Types. Spatial Reference System. (1h)		Lecture notes: PostGIS tutorial 1
C13. Geometry functions (1h)		Lecture notes: PostGIS tutorial 2
C14. Spatial Data Types and		Lecture:

Metadata (1h)		PostGIS tutorial 3
Bibliography • Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition), Addison-Wesley, 2004 • Jeffrey Ullman,Jennifer Widom, A First Course in Database Systems (3rd edition), Prentice Hall, 2007		
7.2 Seminar / laboratory	**Teaching methods**	**Observations**
L1-L5 (10h) Query relational database using SQL SELECT	Hands-on exercises, case studies, explanation and demonstration.	Running SQL queries using PostgreSQL & PG Admin against a pre-built database
L6-L7. (4h) Data definition using SQL CREATE, DROP		Changes applied on existing relational database
L8 (2h) Knowledge evaluation		Practical / written test to assess the intermediary level
L9-L10 (4h) Update relational database records using SQL INSERT, UPDATE, DELETE		Running SQL commands using PG Admin tool against a pre-built database
L11-L12 (4h) Enabling spatial database extensions with PostGIS		
L13-L14. (4h) Managing spatial data in PostgreSQL and PostGIS		
Bibliography •		

8. Corroborating course content with the expectations held by the representatives of the epistemic community, professional associations and typical employers in the field of the study programme

The content of the discipline was developed in accordance with the curriculum and meets the didactic and scientific requirements corresponding to similar specializations in other universities. The relational database approach is the prevalent, de-facto approach used to implement complex systems across multiple businesses, such as financial, commercial, industrial, or online commerce. The local, national and international workforce market is continuously looking for highly skilled personnel to develop, administer or configure relational, and spatial, database management systems.

9. Assessment

Type of activity	9.1 Assessment criteria	9.2 Assessment methods	9.3 Weight in the final mark
9.4 Lecture	• Good understanding of relational database approach; • Relational database design and efficient implementation • Basic understanding of Spatial databases • Design of simple systems using relational database approach; • Argue about advantages and shortcomings of different spatial database approaches	Written test at exam	50%
9.5 Seminar / laboratory	• Design of simple systems using relational database approach; • Use SQL language to represent end-user queries against relational databases	Practical / written test during semester	25%

	• Design of simple systems using relational database approach; • Use SQL language to represent end-user queries against relational databases;	Practical / written test at the end / exam	25%

9.6 Minimum performance standard

Minimal knowledge for passing this subject:

- Good knowledge of basic concepts of relational databases
- Design a simple problem using a relational database
- Identify functional dependencies and use them to normalize the database design to 3NF
- Given a simple relational database design, implement it in a RDBMS using SQL commands
- Ability to write simple SQL queries to retrieve data from 2 joined tables

The final grade is computed as a weighted average of grades obtained for components described in 10.4 and 10.5. The exam is passed if each individual grade obtained at components 10.4 and 10.5 (i.e. both lecture and lab evaluations) are greater or equal to 5. This rule is enforcing for all exam periods. The student need to re-take only the failed component (course or lab grade, respectively), unless the student wishes to re-take both evaluations.

Final remark:

- All students all welcome to tutoring meetings as scheduled by the department.
- **All lectures and seminars are going to be kept in modular approach in last weekend of each month**

Date

12.09.2024

Course convenor's signature

Drd. Ing. Ion- Alexandru Meca

Date of approval in the department

Head of department's signature