Universitatea Națională de Știință și Tehnologie Politehnica București
Facultatea de Electronică, Telecomunicații și
Tehnologia Informației

COURSE DESCRIPTION

1. Program identification information

1.1 Higher education institution	**National University of Science and Technology Politehnica Bucharest**
1.2 Faculty	**Electronics, Telecommunications and Information Technology**
1.3 Department	**Applied Electronics and Information Engineering**
1.4 Domain of studies	Electronic Engineering, Telecommunications and Information Technology
1.5 Cycle of studies	Bachelor/Undergraduate
1.6 Programme of studies	Applied Electronics

2. Date despre disciplină

2.1 Course name (ro) (en)				Baze de date			
2.2 Course Lecturer				S.l./Lect. Dr. Valentin PUPEZESCU			
2.3 Instructor for practical activities				S.l./Lect. Dr. Valentin PUPEZESCU			
2.4 Year of studies	2	2.5 Semester	II	2.6. Evaluation type	V	2.7 Course regime	Ob
2.8 Course type		D	2.9 Course code	04.D.04.O.020		2.10 Tipul de notare	Nota

3. Total estimated time (hours per semester for academic activities)

3.1 Number of hours per week	3	Out of which: 3.2 course	2.00	3.3 seminary/laboratory	1
3.4 Total hours in the curricula	42.00	Out of which: 3.5 course	28	3.6 seminary/laboratory	14
Distribution of time:					hours
Study according to the manual, course support, bibliography and hand notes Supplemental documentation (library, electronic access resources, in the field, etc) Preparation for practical activities, homework, essays, portfolios, etc.					29
Tutoring					0
Examinations					4
Other activities (if any):					0

3.7 Total hours of individual study	33.00
3.8 Total hours per semester	75
3.9 Number of ECTS credit points	3

4. Prerequisites (if applicable) (where applicable)

4.1 Curriculum	- Computer programming (PC) - Data structures and algorithms (SDA) - Object-Oriented programming (POO)

4.2 Results of learning	General knowledge of handling the MySql database management system and the Linux operating system.

5. Necessary conditions for the optimal development of teaching activities (where applicable)

5.1 Course	Not the case.
5.2 Seminary/ Laboratory/Project	Attendance at the laboratory classes.

6. General objective *(Reffering to the teachers' intentions for students and to what the students will be thought during the course. It offers an idea on the position of course in the scientific domain, as well as the role it has for the study programme. The course topics, the justification of including the course in the currcula of the study programme, etc. will be described in a general manner)*

The course presents the main architectural aspects of database systems, as well as programming languages, libraries and interfaces used to implement and use databases and applications for them. The objective of the laboratory applications is for students to know how to work with different database management systems (MySQL, MariaDB, MS SQL Server, Oracle). Also, students are involved in the implementation of databases and applications using programming languages, libraries and specific interfaces (SQL, Transact-SQL, PL/SQL, ODBC, JDBC).

7. Competences *(Proven capacity to use knowledge, aptitudes and personal, social and/or methodological abilities in work or study situations and for personal and proffesional growth. They refflect the empolyers requirements.)*

Specific Competences	Application of elementary knowledge, concepts and methods regarding the architecture of computing systems, microcontrollers, programming languages and techniques.
Transversal (General) Competences	The ability to ensure the planning and management of projects in the field of applied electronics. The ability to constantly inform and document for personal and professional development by reading specialized literature. The ability to communicate and present technical content in both Romanian and English. Flexibility in using new systems and technologies within a team where members together achieve a well-defined goal while assuming different roles or tasks.

8. Learning outcomes *(Synthetic descriptions for what a student will be capable of doing or showing at the completion of a course. The learning outcomes reflect the student's acomplishments and to a lesser extent the teachers' intentions. The learning outcomes inform the students of what is expected from them with respect to performance and to obtain the desired grades and ECTS points. They are defined in concise terms, using verbs similar to the examples below and indicate what will be required for evaluation. The learning outcomes will be formulated so that the correlation with the competences defined in section 7 is highlighted.)*

Knowledge	*The result of knowledge aquisition through learning. The knowledge represents the totality of facts, priciples, theories and practices for a given work or study field. They can be theoretical and/or factual.* List the most important milestones that marked the development of the field of databases. Defines notions specific to the database domain. Describes the basics of the relational data model as well as the MySql database management system. The knowledge gained during the course and laboratory hours can be used in the design and implementation of web/mobile/standalone projects that use any relational database management system (including those that follow the object-relational model - e.g. Oracle, PostgreSql, etc. .)
Skills	*The capacity to apply the knowledge and use the know-how for completing tasks and solving problems. The skills are described as being cognitive (requiring the use of logical, intuitive and creative thinking) or practical (implying manual dexterity and the use of methods, materials, tools and intrumentation).* Select and group relevant information from the database domain. It uses specific principles in order to design and implement specific database projects. Work productively in a team. Experimentally verify identified solutions. Solve practical applications. Analyze and compare several existing data models in the field of databases. Identifies solutions and develops database design plans. Formulates conclusions on the implemented implementations. It argues the identified solutions as well as the ways of solving the data manipulation operations stored in relational databases.
Responsability and autonomy	*The student's capacity to autonomously and responsably apply their knowledge and skills.* Select appropriate bibliographic sources and analyze them. Respect the principles of academic ethics, correctly citing the bibliographic sources used. Demonstrates responsiveness to new learning contexts. Demonstrates collaboration with other colleagues and teaching staff in carrying out teaching activities Demonstrates autonomy in organizing the learning situation/context or the problem situation to be solved Demonstrates social responsibility through active involvement in student social life/involvement in academic community events Promotes/contributes through new solutions related to the specialized field to improve the quality of social life. Realizes the value of its contribution in the field of engineering to the identification of viable/sustainable solutions to solve problems in social and economic life (social responsibility). Apply principles of professional ethics/deontology in the analysis of the technological impact of the solutions proposed in the specialized field on the environment. Analyzes and capitalizes on business/entrepreneurial development opportunities in the specialty area. Demonstrates real-life situation management skills (collaborative vs. conflict time management).

9. Teaching techniques *(Student centric techniques will be considered. The means for students to participate in defining their own study path, the identification of eventual fallbacks and the remedial measures that will be adopted in those cases will be described.)*

Starting from the analysis of students' learning characteristics and their specific needs, the teaching process will explore both expository (lecture, exposition) and conversational-interactive teaching methods, based on discovery learning models facilitated by direct exploration and indirect of reality (experiment, demonstration, modelling), but also on action-based methods, such as exercise, practical activities and problem solving.

In the teaching activity, lectures will be used, based on Power Point presentations or different videos that will be made available to the students. Each course will start with a recap of the chapters already covered, with an emphasis on the concepts covered in the last course.

Presentations use images and diagrams so that the information presented is easy to understand and assimilate.

This discipline covers information and practical activities designed to support students in their learning efforts and the development of optimal collaborative and communicative relationships in a climate conducive to discovery learning.

It will be considered the practice of active listening and assertive communication skills, as well as feedback construction mechanisms, as ways of regulating behavior in various situations and adapting the pedagogical approach to the students' learning needs.

Teamwork skills will be practiced to solve different learning tasks.

The teaching is based on the use of the video projector (covering the communication and demonstration function).

The courses are available online on the Moodle platform.

10. Contents

COURSE		
Chapter	**Content**	**No. hours**
1	1. Basic concepts regarding database systems: 1.1. Architecture of database systems. 1.2. Classification of database systems. 1.3. Data modeling – Entity-Association (E/A) diagram	2
2	2. Relational databases: 2.1. Relationships, domains and attributes 2.2. Relationship integrity constraints (primary, foreign keys) 2.3. Indexing of relationships 2.4. Cursors, stored procedures, triggers	8
3	3. The SQL language: 3.1. The lexical structure of the SQL language 3.2. Data types and SQL domains 3.3. Data definition SQL statements 3.4. SQL instructions for data manipulation	2

4	4. Querying relational databases: 4.1. Relational algebra and relational calculus 4.2. Queries on one or more relationships 4.3. Expression of queries in the SQL language	4
5	5. Development and implementation of databases: 5.1. Development steps of relational databases 5.2. Database design 5.3. Implementation and use of databases	2
6	6. Database Application Programming Languages and Libraries: 6.1. Procedural SQL Extension Languages (Transact-SQL) 6.2. Integrated SQL language (ESQL/C, SQLJ). 6.3. Database application programming interfaces (ODBC, JDBC)	6
7	7. Normalization of databases: 7.1. Functional dependencies and normal forms 7.2. Multivalue and coupling dependencies 7.3. Enforcing dependencies that are not determined by keys through stored procedures and triggers	2
8	8. Transaction management and database recovery: 8.1. Properties and transaction planning 8.2. Techniques for controlling the concurrent execution of transactions 8.3. Database recovery techniques	2
	Total:	28

Bibliography:

- Felicia Ionescu: Baze de Date Relationale si Aplicatii, Editura Tehnica, Bucuresti, 2004.
- Sistemul de gestiune MySQL, http://www.mysql.com
- C.J.Date: An Introduction to Database Systems, Addison-Wesley, 1995.
- R. Dolliner: Baze de Date si Gestiunea Tranzactiilor, Editura Albastra, Cluj, 1997.
- Sistemul de gestiune a bazelor de date Oracle, http:// www.oracle.com
- Sistemul de gestiune SQL Server, http://www.microsoft.com/sql.
- Felicia Ionescu: Indrumar de laborator de Baze de Date

LABORATORY

Crt. no.	Content	No. hours
1	Laboratory 1. Use of relational database management systems	2
2	Laboratory 2. Database query	2
3	Laboratory 3. Design and implementation of relational databases	2
4	Laboratory 4. Normalization of relations	2
5	Laboratory 5. Transaction management	2
6	Laboratory 6. Development of database applications using JSP technology	2
7	Laboratory 7. Colloquium.	2
	Total:	14

Bibliography:
- Felicia Ionescu: Baze de Date Relationale si Aplicatii, Editura Tehnica, Bucuresti, 2004.
- Sistemul de gestiune MySQL, http://www.mysql.com
- C.J.Date: An Introduction to Database Systems, Addison-Wesley, 1995.
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11. Evaluation

Activity type	11.1 Evaluation criteria	11.2 Evaluation methods	11.3 Percentage of final grade
11.4 Course	knowledge of fundamental theoretical notions; knowledge of how to apply the theory for specific database design problems;	Written or online test on the Moodle verification platform during the semester, held on the date fixed at the beginning of the course;	30%
	knowledge of the syntax of MySql extensions to solve the required queries.	Written or online test on the Moodle verification platform during the semester, held on the date fixed at the beginning of the course;	30%
11.5 Seminary/laboratory/project	- the correct design of a database of medium level of complexity;	Final colloquium. It contains a practical test on the computer that consists of: designing and implementing a database from the console level, basic operations on relations, graphical interface to the created database, triggers and stored procedures.	40%
11.6 Passing conditions			
Obtaining 50% of the total score. Obtaining 50% of the score related to the laboratory activity.			

12. Corroborate the content of the course with the expectations of representatives of employers and representative professional associations in the field of the program, as well as with the current state of knowledge in the scientific field approached and practices in higher education institutions in the European Higher Education Area (EHEA)

Database management systems are very important because of their ability to store and manage a lot of data. Moreover, they allow importing as well as exporting data to applications. It also provides data security as well as concurrent access to it. The discipline "Databases" provides vital information for the design, implementation and management of databases by students. The course provides information related not only to relational databases but also information on new approaches in the field of databases (eg NoSQL

databases). The latest technologies are thus presented so that students are as prepared as possible for employment.

Date	Course lecturer	Instructor(s) for practical activities
7.10.2024	S.l./Lect. Dr. Valentin PUPEZESCU	S.l./Lect. Dr. Valentin PUPEZESCU

Date of department approval	Head of department
04.11.2024	Conf. Dr. Bogdan Cristian FLOREA

Date of approval in the Faculty Council	Dean
04.11.2024	Prof. Dr. Mihnea Udrea