# COURSE DESCRIPTION

## 1. Program identification information

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| 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 | Computers and Information Technology |
| 1.5 Cycle of studies | Bachelor/Undergraduate |
| 1.6 Programme of studies | Information Engineering |

## 2. Date despre disciplină

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| 2.1 Course name (ro)<br>(en) | | | | Proiectarea bazelor de date - Proiect | | | |
| 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 | 4 | 2.5 Semester | I | 2.6. Evaluation type | V | 2.7 Course regime | Op |
| 2.8 Course type | | S | 2.9 Course code | 04.S.07.A.109 | | 2.10 Tipul de notare | Nota |

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

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|---|---|---|---|---|---|
| 3.1 Number of hours per week | 1 | Out of which: 3.2 course | 0.00 | 3.3 seminary/laboratory | 1 |
| 3.4 Total hours in the curricula | 14.00 | Out of which: 3.5 course | 0 | 3.6 seminary/laboratory | 14 |
| Distribution of time: | | | | | hours |
| Study according to the manual, course support, bibliography and hand notes<br>Supplemental documentation (library, electronic access resources, in the field, etc)<br>Preparation for practical activities, homework, essays, portfolios, etc. | | | | | 20 |
| Tutoring | | | | | 6 |
| Examinations | | | | | 6 |
| Other activities (if any): | | | | | 4 |

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| 3.7 Total hours of individual study | 36.00 |
| 3.8 Total hours per semester | 50 |
| 3.9 Number of ECTS credit points | 2 |

## 4. Prerequisites (if applicable) (where applicable)

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| 4.1 Curriculum | Completion of the following subjects:<br>Computer Programming (PC)<br>Data Structures and Algorithms (SDA)<br>Object-Oriented Programming (OOP)<br><br>Databases (DB) |
| 4.2 Results of learning | Cunoştinţe generale de baze de date, de programare obiect-orientată şi de manipulare a sistemelor de operare Linux sau Windows precum şi a unor medii de dezvoltare software precum Eclipse, Visual Studio, IntelliJ etc. Dezvoltarea aplicatiilor web sau mobile securizate. |

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

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| 5.1 Course | That's not the case. |
| 5.2 Seminary/ Laboratory/Project | That's not the case. |

**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 project applications aim to familiarize students with how to work with different relational or object-relational database management systems (MySQL, PostgreSql, MariaDB, Oracle) and with technologies for interfacing with them in a secure way (on several levels - administrator or client). Thus, students are involved in projects that involve the design and implementation of databases and applications to access them using various programming technologies (Java, JSP, Java Swing, JavaFX, Hibernate, Java Spring Boot, JavaScript, HTML5, Bootstrap, .NET, C#, Flask, Django etc.), specific libraries and interfaces (SQL extensions, 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.)*

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| **Specific Competences** | Demonstrates basic/advanced knowledge in the field of databases and object-oriented programming<br>Correlates knowledge<br>Applies in practice basic knowledge, concepts and methods regarding the architecture of computer systems, microprocessors, languages and programming techniques.<br>Applies standardized methods and tools, specific to the field, to carry out the process of evaluating and diagnosing a situation, depending on the problems identified/reported, and identifies solutions.<br>Argues and analyzes coherently and correctly the context of application of basic knowledge of the field, using key concepts of the discipline and specific methodology.<br>Oral and written communication in Romanian: uses the scientific vocabulary specific to the field, in order to communicate effectively, in writing and orally. |

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| **Transversal (General) Competences** | Works in a team and communicates effectively, coordinating efforts with others to solve problem situations of medium complexity.<br>Autonomy and critical thinking: the ability to think in scientific terms, to search for and analyze data independently, as well as to extract and present conclusions / identify solutions.<br>Capacity for analysis and synthesis: presents the acquired knowledge in a synthetic manner, as a result of a systematic analysis process.<br>Respects the principles of academic ethics: in the documentation activity, correctly cites the bibliographic sources used.<br>Puts into practice elements of emotional intelligence in the appropriate socio-emotional management of real-life/academic/professional situations, demonstrating self-control and objectivity in decision-making or in stressful situations.<br>Methodical analysis of problems encountered in the activity, identifying elements for which there are established solutions, thus ensuring the fulfillment of professional tasks.<br>Adaptation to new technologies, professional and personal development, through continuous training using printed documentation sources, specialized software and electronic resources in Romanian and, at least, in an internationally spoken language. |

**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.)*

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| **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.*<br>Lists the most important stages that have marked the development of the field of database interfaces.<br>Defines notions specific to the field of databases and the development of secure web interfaces.<br>Describes and classifies the main notions in the field of database interfaces.<br>Highlights consequences and relationships.<br>The ability to constantly inform and document oneself for personal and professional development by reading specialized literature.<br>Application of knowledge, concepts and elementary methods regarding the architecture of computer systems, programming languages and techniques. |

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| **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).*<br>Selects and groups relevant information in a given context.<br>Uses specific principles in an argumentative manner to build complex web/mobile applications.<br>Works productively in a team.<br>Experimentally verifies identified solutions.<br>Solves practical applications.<br>Interprets causal relationships appropriately.<br>Identifies solutions and develops project plans.<br>Formulates conclusions from experiments performed.<br>Argues for identified solutions/solution methods. |
| **Responsability and autonomy** | *The student's capacity to autonomously and responsably apply their knowledge and skills.*<br>Selects appropriate bibliographic sources and analyzes them.<br>Respects the principles of academic ethics, correctly citing the bibliographic sources used.<br>Demonstrates receptivity to new learning contexts.<br>Demonstrates collaboration with other colleagues and teachers in carrying out teaching activities<br>Demonstrates autonomy in organizing the learning situation/context or the problem situation to be solved<br>Manifests social responsibility through active involvement in student social life/involvement in events in the academic community<br>Promotes/contributes through new solutions related to the specialty field to improve the quality of social life.<br>Recognizes the value of his/her contribution in the field of engineering in identifying viable/sustainable solutions that solve problems in social and economic life (social responsibility).<br>Applies principles of professional ethics/deontology in analyzing the technological impact of solutions proposed in the specialty field on the environment.<br>Analyzes and capitalizes on business/entrepreneurial development opportunities in the specialty field.<br>Demonstrates real-life situation management skills (time management, collaboration vs. conflict). |

**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 the 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 and indirect exploration of reality (experiment, demonstration, modeling), but also on action-based methods, such as exercise, practical activities and problem solving.

Lectures will be used in the teaching activity of the project, based on Power Point presentations or various videos that will be made available to students. Each presentation will begin with a recap of the theoretical chapters necessary for the development of certain modules within the web or mobile applications.

The 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 in developing optimal collaborative and communication relationships in a climate favorable to discovery learning.

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

The ability to work in a team will be practiced to solve various learning tasks.

**10. Contents**

| **PROJECT** | | |
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| **Crt. no.** | **Content** | **No. hours** |
| 1 | Basic object-oriented programming concepts that will be used to build secure interfaces to various database management systems. | 4 |
| 2 | Basic concepts of relational or object-relational databases necessary for project construction. Presentation of the MySql Workbench utility for the MySql DBMS, Heidi for the MariaDB DBMS, Microsoft SQL Server Management Studio for the Microsoft SQL Server DBMS and SQL Developer.<br>Building applications in Java that access a database stored in the MySql database management system (for example). | 6 |
| 3 | Designing databases required for web or mobile applications. | 6 |
| 4 | Securing web or mobile applications | 6 |
| 5 | Investigating the possibilities of testing the security of web or mobile applications. Emphasis will be placed on the use of the Kali Linux operating system. | 6 |
| | **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, Valentin Pupezescu: Indrumar de laborator de Baze de Date
- https://www.kali.org/

**11. Evaluation**

| Activity type | 11.1 Evaluation criteria | 11.2 Evaluation methods | 11.3 Percentage of final grade |
|---|---|---|---|
| 11.4 Course | | | |

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| 11.5<br>Seminary/laboratory/project | - correct design of a medium-level database;<br>- creation of the graphical interface and backend of the web or mobile application received at the beginning of the semester. The projects will be individual.<br>- application security;<br>- access on multiple security levels within the application.<br>- creation of application documentation for the presented project. | The score is obtained throughout the year based on the work done during the project hours to complete the required applications. | 100% |
| 11.6 Passing conditions | | | |
| Obtaining 50% of the total score. | | | |

**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 due to their ability to store and manage a lot of data. Moreover, they allow importing as well as exporting data to applications. They also provide data security as well as concurrent access to them. This discipline allows students to learn the latest technologies for accessing database management systems through web or mobile applications. They will learn to perform CRUD operations on data stored in various DBMSs in a secure manner. Students will also receive important instructions on testing application security using operating systems such as Kali Linux. Access to applications will be done in a secure manner on several levels and passwords will be stored in the databases in an encrypted manner.

| Date | Course lecturer | Instructor(s) for practical activities |
|---|---|---|
| 25.09.2025 | S.l./Lect. Dr. Valentin PUPEZESCU | S.l./Lect. Dr. Valentin PUPEZESCU |

Date of department approval

Head of department

Conf.Dr.Ing. Bogdan Cristian FLOREA

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| Date of approval in the Faculty Council | Dean |
| 26.09.2025 | Prof. Dr. Mihnea Udrea |