University of Gdańsk

Subject card

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Subject name and code | Databases, PG_00155447 | | | | | | |
| Field of study | Mathematics | | | | | | |
| Date of commencement of studies | October 2025 | | Academic year of realisation of subject | 2027/2028 | | | |
| Education level | Bachelor's studies | | Subject group | Obligatory subject group in the field of study<br>Optional subject group | | | |
| Mode of study | full-time studies | | Mode of delivery | at the university | | | |
| Year of study | 3 | | Language of instruction | Polish | | | |
| Semester of study | 6 | | ECTS credits | 4.0 | | | |
| Learning profile | academic | | Assessment form | credit | | | |
| Conducting unit | Institute of Mathematics -> Faculty of Mathematics, Physics and Informatics -> Rector | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | | dr Rafał Lutowski | | | | |
| | Teachers | | | | | | |
| Lesson types | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | Number of study hours | 30.0 | 0.0 | 30.0 | 0.0 | 0.0 | 60 |
| | E-learning hours included: 0.0 | | | | | | |
| Learning activity and number of study hours | Learning activity | Participation in didactic classes included in study plan | | Participation in consultation hours | Self-study | SUM | |
| | Number of study hours | 60 | | 5.0 | 35.0 | 100 | |
| Subject objectives | To familiarize students with the theory of databases, mainly the relational model. Preparing students to use selected tools for creating and maintaining databases, as well as modifying and extracting data. Preparing students to work in teams on more complex database projects. | | | | | | |

## Learning outcomes

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [MATL3_U09] is able to plan how to solve a specific problem and prepare a correct record of this solution, providing strict and precise justification for the correctness of his reasoning | designs databases with the usage of E/R diagrams, applies normalization procedures to databases | [SU2] presentation/project/paper/ report<br>[SU4] test/exam - oral or written |
| [MATL3_W12] knows and understands the principles of occupational health and safety | knows and understands safety rules when working with computers | [SW1] oral statement/ conversation/discussion |
| [MATL3_U10] is able to use the known software package or programming language to solve selected issues from the acquired fields, in particular mathematical analysis, linear algebra and statistics | designs databases using an entity relationship diagram, applies standardization procedures to database designs | [SU2] presentation/project/paper/ report<br>[SU4] test/exam - oral or written |
| [MATL3_K03] is ready to work in a team; understands the need for systematic work on all projects that have a long-term character | can work in a team; understands the need to systematically work on all long-term projects | [SK2] presentation/project/paper/ report |
| [MATL3_K04] is ready to understand and appreciate the importance of intellectual honesty in one's own and other people's actions; is willing to act ethically | designs and implements databases | [SK2] presentation/project/paper/ report<br>[SK8] observation of student's independent or team work |
| [MATL3_U11] can recognize problems, including practical issues, that can be solved algorithmically; is able to specify such a problem | designs databases using an entity relationship diagram, applies standardization procedures to database designs<br>implements a database using the structured query language SQL, as well as wizards available in the database management system<br>analyzes database designs in terms of the task to be fulfilled | [SU2] presentation/project/paper/ report<br>[SU4] test/exam - oral or written |
| [MATL3_K01] is ready to accept the limitations of his/her own knowledge and understands the need for further education | knows theoretical background of relational data model | [SK8] observation of student's independent or team work |
| [MATL3_U14] knows how to use computer programmes in the field of data analysis | searches for data using SQL, constructing queries appropriate to given problems | [SU8] observation of student's independent or team work |
| [MATL3_K09] is ready to critically evaluate arguments, find gaps in reasoning and constructively criticize other people's reasoning | knows theoretical background of relational data model | [SK8] observation of student's independent or team work |

## Subject contents

1. Introduction to database systems. Database concept. Entity relationship model. Relationships between entities. Entity relationship diagrams. Database management system.
2. Relational databases. Relational algebra. Relational calculus. Relational query languages.
3. Theory of relational database design. Functional dependencies. Decomposition of relations. Invertible joins. Testing the invertibility of decompositions. Dependency-preserving decompositions. Normal forms of relationship diagrams. Justification for introducing normal forms. Query optimization.
4. SQL. Introduction to SQL. Advanced SQL features.
5. Concurrent database operations. Locks. Transactions.
6. Protecting the database against misuse. Data protection and security. Data integrity. Protection against failures.
7. NoSQL databases. Data models, database examples. CAP principle.
8. Physical organization of databases. Sequential access files. Direct access files. Files with indexsequentialaccess. B-trees. Files with variable length records.

## Prerequisites and co-requisites

1. Logic
2. Properties of actions (associativity, commutativity, distributivity)3. Data structures (hash tables, B-trees)

## Assessment methods and criteria

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| observation of the student's attitude | 51.0% | 0.0% |
| short tests | 51.0% | 10.0% |
| project | 51.0% | 40.0% |
| final test in written or oral form | 51.0% | 50.0% |

| | | |
|---|---|---|
| Recommended reading | Basic literature | 1. C.J. Date, Wprowadzenie do systemów baz danych, Wydawnictwa Naukowo-Techniczne, Warszawa 2000<br>2. K. Douglas, S. Douglas, PostgreSQL, Second Edition, Sams Publishing 2006<br>3. D. Mendrala, M. Szeliga, Access 2010 PL Ćwiczenia praktyczne, Helion, Gliwice 2010<br>4. A. Dybowska-Dyk, M. Bartnik, Ćwiczenia z języka SQL, Mikom, Warszawa 1999<br>5. J. Jędrzejowicz, Bazy danych, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2004 |
| | Supplementary literature | 1. J. Celko, Joe Celkos Complete Guide to NoSQL : What Every SQL Professional Needs to Know About Non-Relational Databases, Morgan Kaufmann 2013<br>2. H. Garcia-Molina, J.D. Ullman, J. Windom, Implementacja systemów baz danych, Wydawnictwa Naukowo-Techniczne,Warszawa 2003<br>3. D. Mendrala, M. Szeliga, Access 2010 PL, Helion, Gliwice 2010<br>4. G. Vaish, Getting Started with NoSQL, Packt Publishing 2013 |
| | eResources addresses | |
| Example issues/ example questions/ tasks being completed | 1. Working with small databases without a computer (for example, making joins).<br>2. Discovering types of relationships between entities.<br>3. Formulating simple SQL formulas without a computer.<br>4. Explaining SQL queries.<br>5. Formulating and proving theorems of Heath and Fagin.<br>6. Finding candidate keys when a functional dependencies are given | |
| Work placement | Not applicable | |

Document generated electronically. Does not require a seal or signature.