# GDAŃSK UNIVERSITY OF TECHNOLOGY

## Subject card

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| Subject name and code | Databases, PG_00047666 |
| Field of study | Informatics |

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| Date of commencement of studies | October 2023 | Academic year of realisation of subject | 2024/2025 |
| Education level | first-cycle studies | Subject group | Obligatory subject group in the field of study |
| | | | Subject group related to scientific research in the field of study |
| Mode of study | Full-time studies | Mode of delivery | at the university |
| Year of study | 2 | Language of instruction | Polish |
| Semester of study | 3 | ECTS credits | 6.0 |
| Learning profile | general academic profile | Assessment form | exam |

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| Conducting unit | Department Of Software Engineering -> Faculty Of Electronics Telecommunications And Informatics -> Wydziały Politechniki Gdańskiej |

| Name and surname of lecturer (lecturers) | Subject supervisor | prof. dr hab. inż. Krzysztof Goczyła |
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| | Teachers | mgr inż. Małgorzata Pykała |
| | | dr inż. Elżbieta Zamiar |
| | | dr hab. inż. Agnieszka Landowska |
| | | dr inż. Aleksandra Karpus |

| Lesson types and methods of instruction | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|---|
| | Number of study hours | 30.0 | 0.0 | 15.0 | 15.0 | 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 |
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| | Number of study hours | 60 | 26.0 | 64.0 | 150 |

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| Subject objectives | The objective of the subject is to learn a student on basic functions of database management system, on design of relational databases and querying them in SQL, on transactional processing, data security nad related problems. The problems concerning distributed and parallel processing are also presented, together with some issues of NoSQL databases. |

| Learning outcomes | Course outcome | Subject outcome | Method of verification |
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| | [K6_U07] can apply methods of process and function support, specific to the field of study | The student is able to analyze simple business processes in terms of database construction. | [SU2] Assessment of ability to analyse information |
| | [K6_W03] knows and understands, to an advanced extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum | The student knows how to create a security model for a relational database, using SQL constructs. | [SW1] Assessment of factual knowledge |
| | [K6_W04] knows and understands, to an advanced extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, and organisation of systems using computers or such devices | The student knows how to embed SQL statements into programs written in procedural languages, and also knows what for and how to use 4GL languages. | [SW1] Assessment of factual knowledge |
| | [K6_U42] can apply tools and methods of designing, optimization, monitoring, management, increasing reliability and protection from safety hazards in local and distributed information systems and applications | The student is able to introduce data security mechanisms into the database model and its implementation. | [SU4] Assessment of ability to use methods and tools |
| | [K6_U06] can analyse the operation of components, circuits and systems related to the field of study, measure their parameters and examine technical specifications | The student is able to analyze the effectiveness of SQL query implementation and apply the appropriate indexes. | [SU1] Assessment of task fulfilment |

| Subject contents | |
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| | 1. Database system architecture 2. Functions of a Database Management System (DBMS) 3. Entity sets, entity attributes, entity keys, relationships 4. Entity relationship diagrams (ERDs) - general concepts 5. Creating entity relationships diagrams 6. Ralational database - definitions 7. Integrity rules: enitity integrity, referential integrity 8. From an entity relationship diagram to a relational database schema 9. Relational algebra: set-theoretic operators 10. Relational algebra: relational operators 11. SQL - an overview, origins, standards 12. Creating tables 13. Populating tables with data 14. Simple queries 15. SQL expressions - simple and conditional 16. Queries with aggregate functions 17. Queries with grouping 18. Queries with joins 19. Queries with outer joins 20. Nested queries 21. Queries for UPDATEs, deletes and bulk inserts 22. Views, operations on views, updatable views 23. Cursors, sequential processing of query results 24. Normalization of relational databases: 2nd and 3rd normal form 25. Boyce-Codd normal form 26. Normalization of relational databases: 4th and 5th normal form 27. Transactional processing in databases - basics 28. Isolation levels in transactions 29. Transactional processing and SQL standards 30. Rules for development of correct database applications in concurrent environments 31. Identification, authenticatrion and authorization in databases 32. Authorization of SQL operations on data: views, GRANT and REVOKE statements 33. Distributed database systems - transparency rules, architecture, fragmentation, replication 34. Non-relational databases - intriduction, object-relational datatypes; applications. Introduction to NoSQL databases. CAP Theorem. |

| Prerequisites and co-requisites | |
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| | No prerequisites |

| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
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| | Project | 50.0% | 25.0% |
| | Written exam | 50.0% | 50.0% |
| | Practical exercise | 50.0% | 25.0% |

| Recommended reading | | |
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| | Basic literature | P.Beynon-Davies. "Systemy baz danych". WNT 2000. C.J.Date. "Wprowadzenie do systemów baz danych". WNT 2000. M.Gruber. "SQL", wydanie drugie. Helion 2000 K.Goczyła, A.Landowska., M.Piechówka. "Bazy danych". Materiały do wykładu. Gdańsk, 2009 |
| | Supplementary literature | No requirements |
| | eResources addresses | Adresy na platformie eNauczanie: Bazy danych - 2024 - Moodle ID: 40245 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=40245 |

| Example issues/ example questions/ tasks being completed | 1. Formulate queries do a relational database 2. What are operators of relational algebra? |
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| | 3. When is the second, third and fourth normal form violated? |
| | 4. What do ACID rules mean? |
| | 5. Design and implement a relational database |
| | 6. Design transacions ina relational database. |
| Work placement | Not applicable |

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