

Subject card

Subject name and code	Databases, PG_00155414						
Field of study	Mathematics						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2025/2026		
Education level	Bachelor's studies		Subject group		Obligatory subject group 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	4		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_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_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 [SU4] test/exam - oral or written
	[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 [SK8] observation of student's independent or team work
	[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 [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_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 implements a database using the structured query language SQL, as well as wizards available in the database management system analyzes database designs in terms of the task to be fulfilled	[SU2] presentation/project/paper/report [SU4] test/exam - oral or written
	[MATL3_W04] knows and understands the basic concepts, methods and theorems of general algebra as well as basic examples that both illustrate specific concepts from these fields and enabling the refutation erroneous hypotheses or unauthorized reasoning	knows relational algebra operators and their properties	[SW4] 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%
	final test in written or oral form	51.0%	50.0%
	project	51.0%	40.0%
Recommended reading	Basic literature	1. C.J. Date, Wprowadzenie do systemów baz danych, Wydawnictwa Naukowo-Techniczne, Warszawa 2000 2. K. Douglas, S. Douglas, PostgreSQL, Second Edition, Sams Publishing 2006 3. D. Mendrala, M. Szeliga, Access 2010 PL Ćwiczenia praktyczne, Helion, Gliwice 2010 4. A. Dybowska-Dyk, M. Bartnik, Ćwiczenia z języka SQL, Mikom, Warszawa 1999 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 2. H. Garcia-Molina, J.D. Ullman, J. Windom, Implementacja systemów baz danych, Wydawnictwa Naukowo-Techniczne, Warszawa 2003 3. D. Mendrala, M. Szeliga, Access 2010 PL, Helion, Gliwice 2010 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). 2. Discovering types of relationships between entities. 3. Formulating simple SQL formulas without a computer. 4. Explaining SQL queries. 5. Formulating and proving theorems of Heath and Fagin. 6. Finding candidate keys when a functional dependencies are given		
Work placement	Not applicable		

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