COURSE UNIT DESCRIPTION

Course unit title	Course unit code
Database Management Systems	**ITRDB**

Lecturer	Department where the course unit is delivered
Coordinator: lector dr. Linas Bukauskas **Others:** lector dr. Agnė Brilingaitė	Department of Computer Science II Faculty of Mathematics and Informatics Vilnius University

Cycle	Type of the course unit
First	Compulsory

Mode of delivery	Semester or period when the course unit is delivered	Languages of instruction
Face-to-face	3rd semester	Lithuanian and English

Prerequisites
Student should have experience in using various text editors, command line, to be able to apply common methods in programming, recognize logical expressions, evaluate and apply set theory knowledge.

Number of ECTS credits allocated	Student's workload	Contact hours	Individual work
5	136	66	70

Purpose of the course unit: programme competences to be developed

Generic competences to be developed

- Ability to use information and communications technologies *(BK5)*
- Ability to act on the basis of ethical reasoning *(BK7)*

Subject-specific competences to be developed

- Ability to apply general methods of the program design, make and analyse software requirements (*DK1)*
- Ability to analyse the algorithmic process of the task based on the general properties of the algorithm *(DK2)*
- Ability to build conceptual and physical data models based on information management and data modelling principles *(DK9)*

Learning outcomes of the course unit	Teaching and learning methods	Assessment methods
Ability to install and manage PostgreSQL DBMS - to create and drop users, schemas, and databases.	Installation and support exercises to perform in the cloud, network computers, and personal laptop; workshops.	Open exam questions to present arguments or to interpret a given script.
Ethical behavior with databases or systems that use databases holding private information.	Practical exercises using shared space or single user, case studies.	
Ability to write semi-complex queries in SQL using arithmetic, text, and time functions, Cartesian product union, intersection, subtraction operators, sub-queries, basic operators, and create tables, related with keys, insert data, and update it.	Writing queries for the formulated requirements/tasks on the specific database schema, consultations, self assessment tests (virtual learning environment); workshops.	Workshop activities, exam questions about SQL, where the logics of a query and correct usage of operators are important.
Ability to recognize SQL and PL/SQL languages in	Search of SQL and PL/(pg)SQL	Exam (practical exercises).

the program code and understand the inner-workings, structure, and know how to change query or program steps.	(PostgreSQL) function in documentation according to the task; analysis of examples and their execution; change and application of examples for another task, consultations.	
Ability to model the conceptual model in ER modeling language from the text description or specification.	Analysis of ER diagrams, interpretation, migration to relational model and vice versa, self assessment tests (virtual learning environment).	Project defence, exam questions about ER and relational algebra, and reverse engineering.
Ability to write relational algebra expressions using projection, selection, join, and set operations, interpret queries.	Writing relational algebra queries for a given model; conversion to SQL and from SQL to relational queries, consultations.	

Course content: breakdown of the topics	**Individual work: time and assignments**							
	Lectures	Consultations	Seminars	Laboratory work (LW)	*Consultation during LW*	**Contact hours**	**Individual work**	**Assignments**
1. What is DBMS ?	1			1		**2**	**1**	Reading literature, installation assignments
2. Usage scenarios of DBMS, components and functions PostgreSQL DBMS	1			2		**3**	**4**	
3. Data model types	2			1		**3**	**2**	
4. ER modeling language and its components. EER extension.	2			2	*2*	**4**	**4**	Project, analysis of examples, homework and classwork
5. Relational model. ER transformation to relational.	2			2		**4**	**4**	
6. Relational algebra	4			4		**8**	**4**	
7. Structured query language in DB. SQL language. DML: most important elements of SQL (projection and selection)	2			4	*4*	**22**	**4**	Classwork and homework, analysis of examples, work with specific DB schemas, workshop
8. DDL: elements of SQL language for the physical model creation	2			2			**4**	
9. DML: elements of SQL language (aggregation, modification, management)	4			4			**8**	
10. Elements of SQL language for creation, manipulation and management. Ethics in databases	2			2			**6**	
11. Functionality of databases. PL/pgSQL	2			2	*2*	**4**	**8**	Analysis of literature, theoretical and practical homework and classwork exercises, workshop
12. Transaction management	2			2		**4**	**2**	
13. Query evaluation	2			2		**4**	**6**	
14. Normalization of database tables. Security of data.	2			2		**4**	**6**	
Preparation for the exam and exam time						**4**	**7**	
Total	**32**	**2**		**32**		**66**	**70**	

Assessment strategy	**Weight %**	**Deadline**	**Assessment criteria**
Project (written work, virtual learning environment)	20	During the first half of the semester	Mini-project is related to ER modelling and its transformation to relational model (RM). The project is done in groups of 2-3 students. Evaluation. ER modelling (0,4 point), ER transformation to RM (0,4 point), queries of relational algebra (0,4 point), defence of the project (0,8). The evaluation is reduced by half when 1-2 little

			mistakes are present, but when mistakes are essential the evaluation is 0. During the defence the student must be able to demonstrate abilities to apply ER and its transformation to RM principles, rules of relational algebra while changing the task requirements.
Exam	80	January	The exam consists of several groups of exercises; each group is assigned a different value based on the abilities that are necessary to present the answers: • theoretical question that requires argumentation (0.5) • interpretation of ER diagram: modelling and updating the model (1) • queries of relational algebra (0.5) • reverse engineering (0.5) • model implementation using SQL DDL (0.5) • SQL queries: writing and interpretation (3) • data management exercises (insertation, update, deletion) (2).

Author	**Publishing year**	**Title**	**Issue No or volume**	**Publishing house or Internet site**
Required reading				
A. Silberschatz, H.F. Korth, and S.Sudarshan,	2005	Database System Concepts		McGraw-Hill
R. Elmasri and S.B. Navathe	2003	Fundamentals of Database Systems		Addison Wesley
R.Baronas	2005	Database management systems (orig. Duomenų bazių valdymo sistemos)		TEV
A. Brilingaitė, L. Bukauskas	2012	Database Management Systems. Study Guide		
Optional reading				
PostgreSQL Global Development Group		Downloads Documentation		http://www.postgresql.org/