MODULE DESCRIPTION

Module title	Module code
Database management systems	

Lecturer(s)	Department where the module is delivered
Coordinator: prof. dr. Romas Baronas **Other lecturers: -**	Department of Software Engineering Faculty of Mathematics and Informatics Vilnius University

Cycle	Type of the module
First	Compulsory

Mode of delivery	Semester or period when the module is delivered	Language of instruction
Face-to-face	3 semester	Lithuanian

Prerequisites
Prerequisites: Procedural programming, Discrete mathematics, IT and communication skills, Objective programming

Number of credits allocated	Student's workload	Contact hours	Self-study hours
5	134	68	66

Purpose of the module: programme competences to be developed

Purpose of the module – to acquire knowledge of database management theory as well as its application expertise, to develop capabilities of the conceptual modeling, database design, creation and management, and to gain professional skills for managing database systems.

Generic competences:

- Communication and collaboration *(GK1).*
- Life-long learning *(GK2).*

Specific competences:

- Knowledge and skills of underlying conceptual basis *(SK4).*
- Software development knowledge and skills *(SK5).*
- Technological and methodological knowledge and skills, professional competence *(SK6).*

Learning outcomes of the module: students will be able to	Teaching and learning methods	Assessment methods
Write SQL queries for retrieving data using the scalar and data aggregation functions by joining tables, grouping data and temporary tables.	Lectures, problem-oriented teaching, case studies, information retrieval, literary reading, individual work, tutorials, laboratory work.	Laboratory works in PostgreSQL environment and results presentation, written exam (open, semi-open and close-ended questions and tasks).
Create conceptual model of a non-complex subject area, represent it as the ER diagram and conclude by the relational model. Be able to choose and apply a proper tool to drawing ER diagrams and relational schemes.		
Create tables adequate to the relational model, to relate tables to each other, to ensure the data integrity, insert into, update and delete data from them.		
Use SQL statements in applications, implementing data retrieval, insertion, updating and deletion.		

Know RDBMS architecture and functionality, data security and user authorization principles and how to manage privileges, data independence levels and their assurance methods.	Lectures, problem-oriented teaching, case studies, literary reading, individual work, tutorials.	Written exam (open, semi-open and close-ended questions and tasks).

Content: breakdown of the topics	**Contact hours**							**Self-study work: time and assignments**	
	Lectures	Tutorials	Seminars	Practice	Laboratory work (LW)	*Tutorial during LW*	**Contact hours**	**Self-study hours**	**Assignments**
1. Basic concepts of DBMS. Components of DBMS, relational DB and their management using SQL language.	2				4		**6**	**4**	Self-study of literature to deeper knowledge. Self-preparation for 1st laboratory work. Getting to know PostgreSQL system catalog.
2. Selecting data from a relational database. SELECT statement, joining tables, grouping data. Temporary tables. DB system catalog.	6				8	*2*	**14**	**10**	
3. Relational data model. First, second, third, Boyce-Codd and forth normal forms.	6				4		**10**	**10**	Self-study of literature. Self-preparation for 1st part of 2nd laboratory work.
4. Conceptual modelling. Entity-relationship (ER) model. ER diagrams. Converting ER model to relational model.	4				4	*2*	**8**	**8**	
5. Creating DB. Defining tables. Inserting data into tables. Deleting and updating data.	2				2		**4**	**4**	Self-study of literature. Self-preparation for 2nd part of 2nd laboratory work.
6. Views. Using and updating views. Logical data independence and its assuring.	2				1	*2*	**3**	**2**	
7. Data integrity. Declaring keys and foreign keys. Constraints on attributes. Event-condition-action rules. Triggers. Transactions.	3				3		**6**	**4**	
8. SQL in a programing environment. Embedded SQL. Static and dynamic SQL. Using call-level interface. Java database connectivity (JDBC).	3				4	*2*	**7**	**8**	Self-study of literature. Self-preparation for 3rd part of 2nd laboratory work.
9. System aspects of DBMS. Security and user authorization in SQL. Indexes. Concurrency control. Transaction isolation and managing its levels.	4				2		**6**	**6**	Self-study of literature.
10. Preparing for the exam and taking the final exam (written).		2					**4**	**10**	Self-study of literature. Self-control tasks.
Total	**32**	**2**			**32**	*8*	**68**	**66**	

Assessment strategy	Weight %	Deadline	Assessment criteria
1st laboratory work	15	March-April	Ability to retrieve data in a training database. The laboratory work covers knowledge and skills that developed in 1 and 2 topics. The laboratory work includes 5 individual assignments for SQL queries of different complexity. Each assignment is assessed by 0.3 points if it is completed and defended in time. Partial implementation of the assignment proportionately reduces the assessment. The laboratory work is performed in parts: 1st and 2nd queries have to be defended during the first 6 weeks, 3rd and 4th queries – by the 8th week, 5th – by the 10th week. Lateness no more than 2 weeks leads to reducing the assessment in 25%, lateness no more than 4 weeks – 50%, lateness no more than 6 weeks – 75%, the assignment cannot be defended afterward.
2nd laboratory work (project)	25	April-May	Ability to apply practical conceptual modelling, database design theory, data modification statements, constraints, and to use SQL statements in programs. The laboratory work covers knowledge and skills that developed in 3-9 topics. The laboratory work consists of three parts. The 1st part (create the ER model and the corresponding relational model for a chosen subject area) is assessed by 0.7 points, 2nd (implement relational model by creating tables and other DB objects) – by 0.9 points, and the 3rd part (develop a program containing SQL statements for main operations with data (data retrieving, inserting, updating, deleting) – by 0.9 points. Partial implementation of the assignment proportionately reduces the assessment. The 1st part of the laboratory work has to be defended by the 12th week, the 2nd – by the 14th week and the 3rd – by the 16th week. Lateness no more than 2 weeks leads to reducing the assessment in 25%, lateness no more than 4 weeks – 50%, the assignment cannot be defended afterward.
Exam (written)	60	Exam session	Ability to demonstrate and apply knowledge. The exam consists of 40 open, semi-open and close-ended questions and tasks each of them is assessed between 0.1 and 0.4 points. The questions are split into 8 groups and formulated from topics set out in lectures.

Author	Publishing year	Title	Number or volume	Publisher or URL
Required reading				
R. Baronas	2005	Database management systems (in Lithuanian)		TEV, Vilnius.
C. J. Date	2003	An Introduction to Database Systems		Addison-Wesley, Boston, USA
Recommended reading				
A. Silberschatz, H. F. Korth, S. Sudarshan	2010	Database System Concepts		McGraw-Hill, New-York, USA
R. Elmasri, S. Navathe	2010	Fundamentals of Database Systems		Addison-Wesley, Boston, USA
The PostgreSQL Global Development Group		PostgreSQL Documentation		http://www.postgresql.org/docs/