| Subject code | ECTS credits |
|:---:|:---:|
| INF2030 | 4 |

**Course title in Lithuanian**

**DUOMENŲ MODELIAVIMAS SU DBVS**

**Course title in English**

**DATA MODELLING WITH DBMS**

**Short course annotation in Lithuanian (up to 500 characters)**

Dalyko kursas supažindina su pagrindinėmis duomenų bazių sistemų (DBS) sąvokomis ir joms keliamais reikalavimais, projektavimo etapais, konceptualiais modeliais, klasikiniais duomenų organizavimo modeliais, reliaciniu duomenų modeliu, reliacinės algebros pagrindais, duomenų bazių normalizacija, užklausų kalbos SQL pagrindais ir jos taikymu duomenų bazėse, duomenų bazių valdymo sistemų vertinimo kriterijais ir jų vystymosi tendencijomis.

**Short course annotation in English (up to 500 characters)**

Course examines general concepts and requirements of database systems, levels of data representation, stages of design, conceptual modeling, classical data models, relational model, fundamentals of relational algebra, relational normal forms, fundamentals of SQL query language and its application in databases, assessment criterions of databases' management systems and their development trends.

**Prerequisites for entering the course**

Programming fundamentals

**Course aim**

Course aim is to provide understanding of databases and database environment; relational data structures for the storage of information as well as to gain practical experience in applying relational data models for design and implementation of database systems.

**Links between course outcomes, criteria of learning achievement evaluation, study methods and methods of learning achievement assessment**

| No | Course outcomes | Criteria of learning achievement evaluation | Study methods | Methods of learning achievement assessment |
|:---:|---|---|---|---|
| 1 | To recognize database (DB) environment | presents correct database environment definition, answering to a given amount of it characterizing questions. | Lectures, practical works, individual work, consulting | Mid-term exam, assessment of practical works |
| 2 | To identify the different levels of data representation and models of data organization | can distinguish between data representation levels and models of data organization | Lectures, practical works, individual work, consulting | Mid-term exam, assessment of practical works |
| 3 | To create a conceptual database model | designs high quality conceptual database model, by selecting particular notation of its formation | Lectures, practical works, individual work, consulting | Final exam, assessment of practical works |
| 4 | To apply suitable techniques of data organization in databases, | adapt suitable techniques of data organization according to given requirements by creating diagrams of data structures | Lectures, practical works, individual work, consulting | Final exam, assessment of practical works |
| 5 | To apply normal forms and relational calculus in creation of relational models of databases, | performs a normalization of databases relational model by applying normal forms correctly | Lectures, practical works, individual work, consulting | Final exam, assessment of practical works |

| 6 | To perform queries and modify relational data models, using SQL query language, | knows and correctly performs a given amount of certain difficulty level queries by using SQL query language | Lectures, practical works, individual work, consulting | Final exam, assessment of practical works |
|---|---|---|---|---|
| 7 | To analyze and put in practice database control systems. | reasonably selects DBVS for database creation | Lectures, practical works, individual work, consulting | Final exam, assessment of practical works |

**Links between study programme outcomes and course outcomes**

| Study programme outcomes | Running number of course outcome | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Know and comprehend the needs and importance of information technologies in study process, also be able to apply programming knowledge and skills, data structures and modelling | + | + | + | + | + | + | + |
| Identify the problem, collect and analyze real/theoretical data using various mathematical methods, tools and IT technologies | + | | + | + | | | + |

**Content**

| No | Content (topics) |
|---|---|
| 1. | Main Concepts of Database Systems. Description of main concepts of database systems, application areas, document bases, knowledge bases. |
| 2. | Database efficiency criteria. Requirements for database systems; efficiency indicators; user interface organization. |
| 3. | Levels of data representation. ANSI/SPARC architecture: external, internal and conceptual levels. Design Stages. |
| 4. | Conceptual modeling. Conceptual models. Main principles of Entity Relation diagram design. |
| 5. | Classical Models of Data Organization. Data structure in hierarchical, network, relational and object models. |
| 6. | Relational data model. Structure and organization principles. |
| 7. | Fundamentals of Relational Algebra. Fundamental operations, Formal Definition of Relational Algebra, Additional Operations. |
| 8. | Relational calculus. Queries' specification using relational calculus. Code rules. |
| 9. | Database normalization. Database normalization concept; relational normal forms, theoretical and practical importance. |
| 10. | Data Retrieval Methods and Application in Database Systems. Database navigation principles; data record sorting, indexing, filtering. |
| 11. | SQL basics. Fundamentals of SQL query language and its application in databases. |
| 12. | Data Integrity Data integrity requirements and their implementation using SQL. |
| 13. | SQL statements in the applications and their execution phases. |
| 14. | Database management systems review and development trends. |

**Distribution of workload for students (contact and independent work hours)**

| Lectures | 30 hours |
|---|---|
| Practical work | 30 hours |
| Individual students work | 60 hours |
| Total: | 120 hours |

**Structure of cumulative score and value of its constituent parts**

Final written exam (50%), mid-term written exam (17%), assessment of practical work (33%).

**Recommended reference materials**

| No | | | | Number of copies in |
|---|---|---|---|---|

| | Publication year | Authors of publication and title | Publishing house | University library | Self study rooms | Other libraries |
|---|---|---|---|---|---|---|
| | | | | *University library* | *Self study rooms* | *Other libraries* |
| *Basic materials* |||||||
| 1. | 2012 | Daiva Kalvaitienė. Duomenų bazių projektavimas (Database Design) Marijampolė | Piko valanda | http://www.esparama.lt/es_parama_pletra/failai/ESF produktai/2012_Duomenu_baziu_projektavimas.pdf |||
| 2. | 2008 | Sekluckis V., Gudas S., Garšva G. Informacijos sistemos ir duomenų bazės. (Information Systems and Databases) Kaunas. | Technologi ja | 100 | - | - |
| 3. | 2005 | Baronas R. Duomenų bazių valdymo sistemos. (Database Management Systems) Vilnius | TEV | 3 | 5 | - |
| 4. | 2003 | Ian Gilfillan. MySQL 4 vadovas. (MySQL Guide) Kaunas. | Smaltija | - | 2 | - |
| *Supplementary materials* |||||||
| 5. | 2016 | Mindaugas Mačernis. Duomenu baziu valdymas: nuo teorijos iki MySQL (Database management from theory to MySQL) Vilnius | Lulu.com | | | |
| 6. | 2008 | Paradauskas B., Nemuraitė L. Duomenų bazės ir semantiniai modeliai. (Databases and Semantic Models) Kaunas | Technologi ja | | | |

**Course programme designed by**

Assoc. prof. dr. Vida Melninkaitė