Databases - course description

General information

Course name	Databases
Course ID	11.3-WE-INFP-Datab-Er
Faculty	Faculty of Computer Science, Electrical Engineering and Automatics
Field of study	Computer Science
Education profile	academic
Level of studies	First-cycle Erasmus programme
Beginning semester	winter term 2021/2022

Course information

Semester	4
ECTS credits to win	6
Course type	obligatory
Teaching language	english
Author of syllabus	• dr hab. inż. Artur Gramacki, prof. UZ

Classes forms

The class form	Hours per semester (full-time)	Hours per week (full-time)	Hours per semester (part-time)	Hours per week (part-time)	Form of assignment
Lecture	30	2	-	-	Exam
Laboratory	30	2	-	-	Credit with grade

Aim of the course

1. Basic knowledge of of modern database systems (relational and NoSQL databases).
2. Engineering skills in implementation of relational models.
3. Engineering skills in SQL language.
4. Engineering skills in database administration.

Prerequisites

Algorithms and data structures. Principles of programming

Scope

Introduction to databases. Database terminology. Basic properties of databases. Requirements for up-to-date databases. Different types of database models (relational, object-relational, object, XML-based, hierarchical, network). The Online Transaction Processing (OLTP) databases, Online Analytical Processing (OLAP) databases. 2-tier and 3-tier architectures. Overview of techniques and tools for creating database applications. Current Relational Database Management Systems (RDBMS).

Entity relationship modeling. Introduction *to relational data models.* Introduction to modeling and design of information systems, especially relational ones. Definition of an entity. Definition of a relation and its basic properties. Entity-relationship modeling. Basic operations on relations (selection, projection, natural joins, outer joins, other types of joins, cartesian product, grouping, unions). Transformation of entity-based models into relational ones. Primary keys, foreign keys, database constraints (unique, null/not null, check). Database normalization and normal forms, Functional dependency. Indexes.

SQL language and query optimization. SQL as a standard access method to data stored in relational databases. Data Manipulating Language DML (INSERT, UPDATE, DELETE statements), Data Definition Language DDL (CREATE, ALTER, DROP statements), Database Control Language DCL (GRANT, REVOKE statements), Transaction Control Language TCL (COMMIT, ROLLBACK, SAVEPOINT, SET TRANSACTION statements). SELECT statement. Creating of database constraints in SQL. Table joins. SQL functions (character, numeric, datatime). Data grouping. Subqueries. Introduction to transactions. Introduction to query optimization and query tuning.

Basics of creating database applications in two- and three-tier architectures. Selected techniques and tools for creating database applications.

Security in databases. Data import and export. Creating backups and data recovery. Database logs. Database consistency and integrity. Different strategies of data backup and recovery (full, partial, incremental, point-in-time recovery).

Teaching methods

Lecture, laboratory exercises.

Learning outcomes and methods of theirs verification

Outcome description	Outcome symbols	Methods of verification	The class form
Has general knowledge about modern information technologies supporting the creation of database applications.		• an evaluation test • an examination test with score scale	• Lecture

Outcome description	Outcome symbols	Methods of verification	The class form
Can create a very simple database application in a selected programming language and a selected technology.		• a quiz • an ongoing monitoring during classes	• Laboratory
Can formulate basic SQL statements.		• a quiz • an ongoing monitoring during classes	• Laboratory
Can install and knows the basics of administering of a selected database management system.		• a quiz • an ongoing monitoring during classes	• Laboratory
Can design simple relational structures.		• a quiz • an ongoing monitoring during classes	• Laboratory
Knows the basic concepts related to relational databases (relational model, relational operations, normalization, primary and foreign keys, database constraints, database transactions, database indexes, SQL language).		• an evaluation test • an examination test with score scale	• Lecture

Assignment conditions

- Lecture – the passing condition is to obtain a positive mark from the final test.
- Laboratory – the passing condition is to obtain positive marks from all laboratory exercises to be planned during the semester.
- Calculation of the final grade: lecture 50% + laboratory 50%

Recommended reading

1. Date C.J.: *An Introduction to Database Systems*, *6th Edition*. Addison-Wesley, 1995
2. Garcia-Molina H., Ullman J.D., Widom J.: *Database Systems: The Complete Book*, Prentice Hall, 2007
3. Ullman J.D., Widom J.*: A First Course in Database Systems, 3nd Edition*, Prentice Hall, 2001
4. Date C.J., Darwin H.: *Guide to SQL Standard, 4th Edition*, Addison-Wesley, 1997.

Further reading

Notes

Modified by dr hab. inż. Artur Gramacki, prof. UZ (last modification: 14-07-2021 13:29)

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