COURSE DESCRIPTION CARD - SYLLABUS

Course name
Databases [S1Teleinf1>BD]

Course

Field of study
Teleinformatics

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

5,00

Coordinators

dr inż. Tomasz Koszlajda
tomasz.koszlajda@put.poznan.pl

Lecturers

Prerequisites

A student starting this course should have basic knowledge of the basics of programming, computer system architecture, operating systems and database systems. He/she should have the ability to acquire information from indicated sources. They should also understand the necessity of broadening their competences and be ready to cooperate within a team. In addition, in terms of social competence the student must present such attitudes as honesty, responsibility, perseverance, cognitive curiosity, creativity, personal culture, respect for other people.

Course objective

The main goal is to provide students with basic knowledge of database systems technology, necessary for the proper design, use and implementation of database systems and their applications, and to develop students the skills of solving problems that arise during the management of database systems.

Course-related learning outcomes

Knowledge
Students have a well-ordered, theoretically-based general knowledge of corporate databases (K1st_W4), have detailed knowledge of database systems management, including transactionality,

the mechanism of database recovery after a failure (K1st_W5), has basic knowledge of database systems life cycle (K1st_W6), and knows basic methods, techniques and tools used in solving simple computer tasks concerning database management (K1st_W7).
Skills
The student is able to acquire knowledge from various sources, including literature and databases, and to interpret it properly, to draw conclusions and to justify opinions (K1st_U1). Can, solving a problem of data processing in databases, apply adequate methods and algorithms (K1st_U4).
He/her is able to critically analyse the functioning of a database system and prepare functional and efficiency tests of an information system using a database system (K1st_U9). He/her can, according to a given specification, prepare and implement a model of a fragment of reality, formulate a functional specification of an information system and implement an information system using a database system with the application of one of the popular DBMS (K1st_U10). They can formulate data processing algorithms and implement them using at least one of the popular tools (K1st_U11) and
Is able to plan and carry out the process of self-education and knows the possibilities of further education (K1st_U19).
Social competences
The student understands that in computer science, within the issues of databases, knowledge and skills become obsolete very quickly (K1st_K1). He/her is aware of the importance of database knowledge in solving engineering problems, and knows examples and understands reasons of malfunctioning IT systems (K1st_K2). Is able to think and act in an entrepreneurial manner (K1st_K3).

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes are verified as follows:
- continuous evaluation, at each class (oral answers) - to reward the growth of skills in the use of known principles and methods,
- evaluation of knowledge and skills demonstrated in the written test of problem-based character.
- assessment of knowledge and skills demonstrated in a test consisting of closed questions, but in this case the maximum grade that can be obtained in this way is a 3.0 grade.

Verification of the assumed learning outcomes in the laboratory is realized by:
- the assessment of the student's preparation for individual laboratory sessions
- The credit test in the form of a test (approx. 20-30 questions)
- The realization of the tasks from individual topics by the student.
Obtaining a positive mark from the laboratory requires: (1) completion of the tasks from the obligatory topics and (2) scoring at least a sufficient grade from the test. The following grading scale is adopted depending on the number of points obtained: <0;50%>: ndst, (50%;60%>: dst, (60%;70%>: dst+, (70%;80%>: db, (80%;90%>: db+, (90%;100%>: bdb.
Students have the opportunity to increase their grade for completing additional assignments in optional topics.

Programme content

The course programme includes the following topics:
- Introduction to database systems; the concept and architecture of database systems;
- Life cycle of a database system;
- Relational data model, SQL language;
- Conceptual database schema modelling, Extended Entity Relationship model;
- Conceptual database schema transformation to relational schema;
- normalization of logical database schemas;
- disk-based data structures, e.g., sorted, hash, and clustered files; single-level, tree-based, and bitmap indexes;
- Data access methods, e.g. binary search method, external sorting, sort-merge, nested-loop, hash join;
- Transactional processing, definition and ACID properties of transactions;
- Database recovery (atomicity property); recovery of lost data (persistence property);
- Definition of correctness of concurrent transaction histories (isolation property);
- Synchronization of concurrent transaction histories using two-phase locking, timestamps and optimistic protocols.

As part of the lab, students will learn:
1. A declarative language for accessing relational databases called SQL, presented broken down as follows:
- Simple queries.
- Data grouping.
- Joins and collective operators.
- Subqueries.
- Advanced mechanisms in queries.
- Data manipulation language (DML).
- Data definition language (DDL).
- Perspectives.
Database modelling principles:
- Entity relationship modelling. - Principles of entity relationships transformation to a selected implementation model.
Part of the above-mentioned curriculum content is implemented as a part of students' own work.

Course topics

The course covers the following topics: Introduction to database systems;
database system concept and architecture;
- database system lifecycle;
- relational data model, SQL;
- modeling conceptual database schemas, EER diagrams;
- transformation of conceptual database schemas to relational schemas;
- normalization of logical database schemas;
- disk data structures, e.g., sorted, hash, and clustered files, single-level indexes,
tree and bitmap indexes;
- data access methods, e.g., halving, external sorting, sort-merge, nested-loop,
hash join;
- transaction processing, definition and properties of ACID transactions;
- restoring a consistent database state (atomicity property); recovering lost data (durability property);
- defining the correctness of concurrent transaction histories (isolation property);
- Synchronization of concurrent transaction histories using two-phase locking protocols, timestamps, and optimistic methods.
In the lab, students will learn:
1. SQL, a declarative language for accessing relational databases, presented in the following sections:
- Simple queries.
- Data grouping.
- Joins and collective operators.
- Subqueries.
- Advanced query mechanisms.
- Data manipulation language (DML).
- Data definition language (DDL).
- Perspectives.
2. Principles of database modeling:
- Modeling entity relationships. - Principles of transforming entity relationships into a selected implementation model. Some of the above-mentioned program content is implemented as part of the student's own work.

Teaching methods

1. Lecture: multimedia presentation, presentation illustrated by examples given on the blackboard.
2. Laboratory classes: multimedia presentation, presentation illustrated with examples given on the blackboard, practical exercises, workshops.

Bibliography

1. Garcia-Molina H., Ullman J.D., Widom J., Implementacja systemów baz danych, WNT, 2003
2. J.D. Ullman, J. Widom, Podstawowy wykład z systemów baz danych, WNT, W-wa, 2000
3. Elmasri R., Navathe S., Wprowadzenie do systemów baz danych, Wyd. Helion, (4th Edition), 2005
4. Jason Price, Oracle Database 12c i SQL : programowanie, Helion, Gliwice 2015

5. Readings in Database Systems, 5th edition, P. Bailis, J. M. Hellerstein, M. Stonebraker

Breakdown of average student's workload

	Hours	ECTS
Total workload	116	5,00
Classes requiring direct contact with the teacher	60	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	56	2,00