COURSE DESCRIPTION CARD - SYLLABUS

Course name
Databases [S1Bioinf1>BDAN]

Course

Field of study
Bioinformatics

Year/Semester
2/4

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

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Lecturers

Prerequisites

The student starting this course should have basic knowledge regarding basics of programming, computer systems architectures and operating systems. He/she should have skills that are necessary to acquire information from given sources of information and be ready to work in a team. Moreover, the student should show such attitudes as honesty, responsibility, perseverance, curiosity, creativity, personal culture, and respect for other people.

Course objective

Provide students with basic knowledge of database technology necessary for the correct design, use and implementation of database systems. Develope students" skills in solving problems arising in the management of database systems.

Course-related learning outcomes

Knowledge:
1. The student has knowledge of database systems, which entitles him to correctly use and implement database systems and their applications.
2. The student has knowledge of the principles of design and implementation of relational databases

(Entity Relationship Diagram , transformation to relational database model, normalization)
3. The student has knowledge of physical and index structures used in modern databases
4. The student has knowledge about the life cycle of database systems

Skills:
1. The student is able to design and build simple database systems using at least one of the most popular database management systems
2. The student is able to use materials in the form of literature, teaching materials and technical documentation of database systems
3. The student is able to use the acquired skills to create software, e.g. in the form of generated reports, and software for managing and manipulating data in the database
4. The student is able to programme in SQL and PL/SQL language

Social competences:
1. The student understands that the acquired knowledge and skills are the beginnig of working with databases
2. The student is aware that working with databases consists of several stages from designing, maintaining and working with data. By implementing a project as a team, he gains experience in allocating tasks and prioritizing individual tasks
3. due to the practical nature of the course, the student learns to think and act in an enterprising manner
4. The student understands that knowledge and skills in the field of databases must be constantly expanded and updated

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
The knowledge acquired during the lecture is verified by two 45-minute tests carried out during the 7 and 15 lecture, consisting of 10-15 questions (test and open), with diversified scores. Passing threshold: 50% of the total score. Topics, based on which the questions are developed, will be sent to students by university e-mail.
The skills acquired during the laboratory classes are verified by a test, consisting of 5-7 questions (test and open) with diversified scores and through project of sample database. Passing threshold: 50% of the total score.

Programme content

During the theoretical part of the course, students acquire knowledge of:
• Key concepts and principles related to database system technologies.
• Fundamentals of designing, implementing, and using database systems.
• Methods of data modeling and normalization in relational databases.
• Programming and data manipulation using the SQL language.
• Logical and physical organization of data in database systems.
• Transaction management mechanisms and ensuring data integrity.
• Modern alternatives to relational databases, including NoSQL solutions.

During the practical classes, students develop skills in:
• Working with relational database management systems (RDBMS).
• Creating and executing SQL queries at various levels of complexity.
• Using aggregate functions, joins, and subqueries for data analysis.
• Applying advanced SQL constructs, including recursive and hierarchical queries.
• Manipulating data using DML commands and defining database structure using DDL.
• Creating and utilizing views (perspectives).
• Data modeling using entity-relationship diagrams and graphical database design tools.

Course topics

Lectures cover the following topics:
1. Basic concepts and concepts of database systems technology necessary for the correct design of

databases
2. Basic principles of using and implementing database systems and their applications
3. Basic principles of database modeling and design
4. Using a relational database system
5. Programming in SQL - a standard language of databases
6. Standardization of logical database schemas and logical organization of data and basic physical data structures used in database systems
7. Basic principles of transaction management in database systems
8. NoSQL databases - basic concepts and solutions
The lab-classes should cover the following topics:
1. Introduction (data model, database system architecture, database management system functions, relational data model)
2. Simple queries (projection and SELECT clause, selection with WHERE, SQL operators, sorting the query result - ORDER BY)
3. Advanced selection with functions (selection by time elements, strings and numbers, conditional statement)
4. Aggregate functions (AVG, COUNT,MIN,MAX etc. , GROUP BY and HAVING clauses)
5. Basics of SQL joins (inner join, nonequi join, natural join, explicit and implicit syntax, self join)
6. Advanced SQL joins and set operators (outer join, Cartesian product, set operators)
7. Basics of SQL subqueries (regular subqueries, ANY/SOME, ALL operators)
8. Advanced SQL subqueries (correlated subqueries, EXISTS, Subqueries in SELECT, FROM and ORDER BY
clause)
9. Advanced query mechanisms (limit the size of the result set, WITH clause, hierarchical queries)
10. The Data Manipulation Language DML (INSERT, UPDATE, DELETE, updatable join, sequences)
11. The Data Definition Language DDL (create table, types of data, default values of attributes , data dictionary,)
12. Views (simple and complex views, updatable and non updatable views)
13. Conceptual modeling (Entity Relationship Diagram, data modeling tools)

Teaching methods

1. Lecture: multimedia presentation augmented with additional examples given on the whiteboard.
2. Laboratory exercises: solving tasks, practical exercises, teamwork, multimedia presentation.

Bibliography

Basic
1. Garcia-Molina H., Ullman J.D., Widom J., Systemy baz danych – kompletny podręcznik, wyd. II, Helion, 2011 (seria: Kanon Informatyki)
2. J.D. Ullman, J. Widom, Podstawowy kurs systemów baz danych, Helion, 2011 (seria: Kanon Informatyki)
3. Elmasri R., Navathe S., Wprowadzenie do systemów baz danych, Helion, (4th Edition), 2005
4. M. Szeliga: ABC języka SQL. Helion
5. A. Jakubowski: Podstawy SQL. Ćwiczenia praktyczne. Helion.
6. M. Gruber: SQL. Helion
Additional
R. Coburn: SQL dla każdego. Helion

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	65	2,50