COURSE DESCRIPTION CARD - SYLLABUS

Course name
Database Performance [S2Inf1E-IO>WBD]

Course

Field of study
Computing

Year/Semester
1/1

Area of study (specialization)
Software Engineering

Profile of study
general academic

Level of study
second-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
30

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

5,00

Coordinators

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Lecturers

Prerequisites

Learning objectives of the first cycle studies defined in the resolution of the PUT Academic Senate, especially K_W1-2, K_W4, K_W6-15 that are verified in the admission process to the second cycle studies – the learning objectives are available at the website of the faculty. Learning objectives of the first cycle studies defined in the resolution of the PUT Academic Senate, especially K_U1-2, K_U4, K_U7-8, K_U14-20, K_U22-23, K_U26 that are verified in the admission process to the second cycle studies – the learning objectives are available at the website of the faculty. Learning objectives of the first cycle studies defined in the resolution of the PUT Academic Senate, especially K_K1-9 that are verified in the admission process to the second cycle studies – the learning objectives are available at the website of the faculty. In addition, in respect to the social skills the student should show attitudes as honesty, responsibility, perseverance, curiosity, creativity, manners, and respect for other people.

Course objective

1. Provide students with knowledge regarding database server performance evaluation and management techniques. 2. Develop students' skills in solving problems related to performance issues in database applications.

Course-related learning outcomes

Knowledge:
has well-established theoretical knowledge regarding algorithms and computational complexity, computer systems architecture, operating systems, networking technologies, programming languages and paradigms, graphics and human-computer interaction, artificial intelligence, databases, software engineering, decision support, and embedded systems (k2st_w3)
has detailed theoretical knowledge related to selected areas of computer science: database management system architecture, performance evaluation tools and techniques, cost-based query optimization in database systems, database performance management (k2st_w2)
has knowledge regarding trends and the most important new developments in database systems (k2st_w4)
has basic knowledge regarding life-cycle of database systems (k2st_w5)
knows the fundamental methods, techniques and tools employed to solve complex engineering tasks in the area of database systems performance (k2st_w6)

Skills:
is able to cooperate in a team to solve performance-related problems (k2st_u15)
is able to employ analytical, simulation, and experiment methods to formulate and solve engineering tasks related to performance modeling (k2st_u3, k2st_u4)
is able to combine knowledge from different areas of computer science (and if necessary from other scientific disciplines) to formulate and solve performance tuning tasks (k2st_u5)
is able to assess usefulness and possibility of employing new developments (methods and tools) and new it products (k2st_u10)

Social competences:
understands that knowledge and skills related to computer science quickly become obsolete (k2st_k1)
understands the importance of referring to the current knowledge when solving research and practical problems (k2st_k6)

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomespresented above are verified as follows:
Lectures: final exam in the form of a test of choice, including 30 tasks.
Laboratories: final project in the form of a research experiment, described in a written report.

Programme content

Lectures' curriculum covering the following topics:
Introduction to PostgreSQL database server"s architecture. Fundamental administrative tasks. Query Planner role and operations. Analysing and diagnosing query execution plans. Statistics for Query Planner. Query optimization using versatile index structures. Advanced table structures and their performance implications. In-memory buffers of PostgreSQL database server. Parallel Query execution: architecture and techniques. Using database replication and database sharding. Database server monitoring tools and techniques. Database benchmarks" history. PostgreSQL performance testing using pgBench. Other performance tuning techniques.
Laboratory classes: fifteen 90-minutes blocks, conducted in a lab room, 2-hour introduction at the beginning of the semester. Students solve tasks individually. Laboratory classes curriculum covering the following topics:
PostgreSQL installation and configuration. Basic administrative tasks. Query execution plan analysis, detection and diagnostics of performance problems. Creating database indexes, partitioned tables, temporary tables, materialized views. In-memory buffers" impact on query performance.Configuring and monitoring Parallel Query execution. Implementing database replication environments. PostgreSQL performance testing using industry-standard database benchmarks.

Course topics

none

Teaching methods

1. Lectures: multimedia presentation, demonstration.

2. Hands-on practices: problem solving, experiments, discussions

Bibliography

Basic
1. "PostgreSQL 10 High Performance: Expert Techniques for Query Optimization, High Availability, and Efficient Database Maintenance", Enrico Pirozzi, Packt Publishing, 2018
2. PostgreSQL Documentation, vendor’s documentation, https://www.postgresql.org/docs/
Additional

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