STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Database Performance	**1010512311010517862**

Field of study	Profile of study (general academic, practical)	Year /Semester
Computing	**general academic**	**1 / 1**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Software Engineering	**English**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
Second-cycle studies	**full-time**

No. of hours	No. of credits
Lecture: **30** Classes: **-** Laboratory: **30** Project/seminars: **-**	**5**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
major	**from field**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**5 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	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 www.fc.put.poznan.pl
2	**Skills**	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 www.fc.put.poznan.pl
3	**Social competencies**	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 www.fc.put.poznan.pl 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.

Assumptions and objectives of the course:

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.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. 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 - [K_W4]
2. 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 - [K_W5]
3. has knowledge regarding trends and the most important new developments in computer science and related disciplines - [K_W6]
4. has basic knowledge regarding life-cycle of software or hardware systems - [K_W7]
5. knows the fundamental methods, techniques and tools employed to solve complex engineering tasks in a selected area of computer science - [K_W8]

Skills:

1. is able to acquire, combine, interpret and evaluate information from literature, databases and other information sources (in mother tongue and English); draw conclusions, and formulate opinions based on it. - [K_U1]
2. is able to plan and arrange self-education process - [K_U5]
3. has language skills at B2+ level in accordance with the requirements set out for level B2+ Common European Framework of Reference for Languages - [K_U6]
4. is able to employ analytical, simulation, and experiment methods to formulate and solve engineering tasks and basic research problems - [K_U9]
5. is able to combine knowledge from different areas of computer science (and if necessary from other scientific disciplines) to formulate and solve engineering tasks; and use system approach that also incorporates nontechnical aspects - [K_U10]
6. is able to formulate and test hypotheses regarding engineering problems and basic research problems - [K_U12]
7. is able to assess usefulness and possibility of employing new developments (methods and tools) and new IT products - [K_U13]

Social competencies:

1. understands that knowledge and skills related to computer science quickly become obsolete - [K_K1]
2. is able to correctly assign priorities to own tasks and tasks performed by others - [K_K6]

Assessment methods of study outcomes

Formative assessment:

a) lectures:

- based on answering questions on topics addressed during past lectures,

b) laboratory classes / tutorials / projects / seminars:

- based on current activities,

Summative assessment:

a) verification of assumed learning objectives related to lectures:

- final exam - a test of choice, 30 questions, positive evaluation starts at 15 correct answers
- discussion on exam results,

b) verification of assumed learning objectives related to laboratory classes / tutorials / projects / seminars:

- written report

Extra points for outstanding activity:

- discussion on other aspects of the presented issues

Course description

Lectures? curriculum covering the following topics:

Introduction to Oracle Database server internal architecture. Memory buffers: Buffer Cache, Library Cache, Query Results Cache, Redo Log Buffer. Oracle Database server administration fundamentals. Cost-based query optimization: accessing query execution plans, query transformations, evaluating costs of query execution plans, statistical models, query optimizer hints. Introduction to database server performance tuning. Response time modeling. Response time components: server activity, wait events. Tools and techniques for Oracle Database server performance monitoring: dynamic performance views, Statspack, AWR, ADDM. Physical structures for data storage. Storage allocation. Tablespaces, segments, partitions, extents, data blocks. Physical structures for efficient query execution. Index classification: B*-tree indexes, bitmap indexes, reversed key indexes, compressed indexes, function-based indexes, bitmap join indexes, partitioned indexes. Materialized views and automatic query rewriting. Using bind variables in SQL queries. TPC Benchmarking.

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:

Installing and configuring Oracle Database server software. Basic database administration tasks. Analyzing query execution plans generated by the cost-based query optimizer. Gathering and refreshing optimizer statistics. Influencing query execution plans. Using bind variables in SQL queries. Planning and building index structures to improve query performance. Managing memory buffers. Tools for database server performance monitoring. Using materialized views and automatic query rewrite. Performance management for database backup and recovery operations. Workshops on identifying/diagnosing performance problems and resolving the performance problems by using indexing, partitioning, materialization, buffering and query transforming.

Learning methods:

1. Lectures: multimedia presentation, presentation illustrated with examples presented on black board, demos.
2. Tutorials: solving tasks, practical exercises, discussion, case studies, demos.

Basic bibliography:

1. Oracle Database Concepts, vendor?s documentation, www.oracle.com
2. Oracle Database Performance Tuning Guide, vendor?s documentation, www.oracle.com
3. Oracle Database Administrator's Guide, vendor?s documentation, www.oracle.com

Additional bibliography:		

Result of average student's workload	
Activity	**Time (working hours)**
1. participating in laboratory classes / tutorials: 15 x 2 hours,	30
2. consulting issues related to the subject of the course; especially related to laboratory classes,	10
3. preparing to laboratory classes and writing a report	20
4. participating in lectures	30
5. studying literature / learning aids (10 pages = 1 hour), 100 pages	10
6. discussing the results of the examination	2
7. preparing to and participating in exams: 10 hours + 2 hours	12

Student's workload		
Source of workload	**hours**	**ECTS**
Total workload	124	5
Contact hours	74	3
Practical activities	50	2