COURSE DESCRIPTION CARD - SYLLABUS

Course name
Data warehouses [N2Inf1-IWPB>HD]

Course

Field of study
Computing

Year/Semester
1/2

Area of study (specialization)
Information Technology in Business Processes

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
part-time

Requirements
elective

Number of hours

Lecture
16

Laboratory classes
16

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

The student starting this course should have basic knowledge of database systems and programming languages. They should have the ability to solve basic problems in designing IT systems, administering database systems, formulating commands in SQL and the ability to obtain information from the indicated sources. They should also understand the need to expand their competences / be ready to cooperate with the team. Moreover, in terms of social competences, the student must present such attitudes as honesty, responsibility, perseverance, cognitive curiosity, creativity, personal culture, respect for other people.

Course objective

Identification of practical problems that are solved by designing, implementing and implementing data warehouse systems and business data analysis (BI). Provide students with knowledge about designing data warehouse systems in the field of: architectures, data modeling, designing the integrating and supply layer - ETL, physical structures, metadata management, data warehouse development trends and BI systems. Developing skills in formulating data analysis problems and using languages and tools supporting data analysis. Presentation of the problems of implementing a data warehouse and BI class applications. Developing problem-solving skills in the field of: designing and implementing a data warehouse system, assessing the suitability of DW and BI technologies for a specific application. Developing students" teamwork skills as part of building data warehouse systems and business data analysis systems. Developing students" skills in implementing DW and BI projects. Developing the ability to use sources of knowledge (eg English-language publications), self-education and time management.

Course-related learning outcomes

Knowledge:
1.has ordered, theoretically founded general knowledge in the field of IT systems architecture, in particular data warehouses and databases (K2st_W4)
2. has theoretically founded detailed knowledge related to selected issues in the field of computer science, such as: data integration architecture and technologies, methodology of designing an information system (in particular data warehouses), data analysis technologies, data storage models (K2s-W5)
3. has knowledge of development trends and the most important new achievements in the field of data processing and data warehouse (K2s-W6)
4. has a basic knowledge of the life cycle of IT systems, in particular data warehouse systems (K2s-W7)
5. knows the basic methods, techniques and tools used in solving complex engineering tasks in the selected area of computer science (designing and implementing a data warehouse system, designing and implementing data warehouse schemes, data analysis, report visualization, designing analytical queries) (K2s-W8)

Skills:
As a result of the course, the student should demonstrate skills in the following areas (the student is able to):
1.obtain information from literature, databases and other sources (in the mother tongue and in English), integrate them, interpret and critically evaluate them, draw conclusions and formulate and exhaustively justify opinions (also prepare presentations and technical reports) (K2s-U1)
2. define the directions of further learning and implement the self-education process (K2s-U5)
3. use experimental methods to formulate and solve engineering tasks and simple research problems (K2s-U9)
4.integrate knowledge from various areas of computer science (e.g. software engineering, IT systems administration, databases) and apply a system approach, also taking into account non-technical aspects (K2s-U10)
5.formulate and test hypotheses related to engineering problems and simple research problems (K2s-U12)
6. evaluate the usefulness and the possibility of using new achievements (methods and tools) and new IT products (in particular database management systems, ETL programming environments) (K2s-U13)

Social competences:
Completing the course means that the student:
1.understands that in computer science, knowledge and skills very quickly become obsolete (K2s-K1)
2. knows the examples and understands the causes of defective and properly functioning IT systems (in particular data warehouse systems) (K2s-K4)
3. is able to properly define priorities for the implementation of a task set by himself or others (K2s-K6)
4.can cooperate and work in a group, assuming various roles in it (including project manager, analyst, programmer) (K2s-K5)

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:

Formative assessment:
a) in the field of lectures:
• on the basis of answers to questions about the material discussed during the lectures,
b) in the field of laboratories:
• based on the assessment of the current progress in the implementation of tasks,
Summative assessment:
a) in the field of lectures, verification of the assumed learning outcomes is carried out by:
• assessment of knowledge and skills demonstrated in the form of a test with open-ended questions and single- or multiple-choice questions;
The test consists of a series of open-ended questions (15-30) and single or multiple choice. The test is considered passed after obtaining more than 50% of the possible points. The following scale of grades and points is adopted: <0; 50%>: N / A, (50%; 60%>: dst, (60%; 70%>: dst +, (70%; 80%>: db, (80 %; 90%>: db +, (90%; 100%>: very good
• discussing the test results;
b) in the field of laboratories / exercises, verification of the assumed learning outcomes is carried out by:
• assessment of the implementation of tasks assigned to each class,
• assessment of knowledge and skills related to the implementation of laboratory tasks by taking one test at the end of the semester.
• obtaining additional points for activity during classes, especially for:
o discuss additional aspects of the issue,
for remarks related to the improvement of teaching materials.

Programme content

The lecture program covers the following topics:
1) introduction to the issues of data analysis, data warehouse and business intelligence (justification of the need to use these technologies), 2) OLTP vs. OLTP analytical systems, SQLBI technological stack, 3) data warehouse system architecture, 4) data modeling (conceptual multidimensional model, tabular model, data schemas: stars, snowflake, constellation of facts), 5) dimension modeling issues with particular emphasis on slowly changing dimensions 6) DW data model components: fact tables, dimension tables, measures, KPIs, 7) data integration issues for data warehouses, designing the ETL layer, 8) designing data flows in ETL processes, 9) using the SQL language and analytical functions to data analysisin BI, 10) tabular model: the meaning and use of DAX (Data Analysis Expressions), 11) creating reports and dashboards as analysis results, 12) multidimensional models: creating cubes and operating on a cube in MDX language (MultiDimensional Expressions), 13) selected physical structures and optimization problems.
Laboratory classes are conducted in the form of four 4-hour classes, held in the laboratory. The curriculum is divided into eight parts: 1. Introduction to the laboratory environment. 2. Creating a tabular data model and business data analysis in the Power BI Desktop environment. 3. Advanced functions of data analysis using DAX. 4. Creating a data warehouse in the SQL Server environment, using SQL functionality and SQL analitical functions. 5. ETL processes in the SQL Server Integration Services. 6. Creating a tabular data analysis model for a data warehouse (SQL Server Analysis Services and Visual Studio SSDT in tabular modeling). 7. Define measures, calculated columns and KPIs, create reports and dashboards. 8. Creating a multidimensional model and data cubes, using MDX and Excel Power Pivot. 9. Integration and cooperation of individual components of the SQLBI technological stack. Consider creating reports and visualizing analysis results using dashboards.
Classes are conducted in the form of computer classes, with each student working independently. Each task is preceded by a short presentation and then the discussed issues are practiced.

Teaching methods

1. lecture: multimedia presentation, the presentation is supplemented with short examples presented in a traditional way with the use of a blackboard, problem solving and discussing solutions on the blackboard, many problems are discussed by the method of computer presentation;
2. laboratories: multimedia presentation, the presentation is supplemented with short examples presented in a traditional way with the use of a blackboard, performing exercises in a data warehouse, discussing more difficult exercises at the blackboard, answering questions on a regular basis, solving problems on an ongoing basis, work on computers dominates.

Bibliography

Basic
[1] M., Jarke, M., Lenzerini, Y., Vassiliou, Fundamentals of Data Warehouses , 2nd Edition, Springer, 2003.
[2] M. Russo, A. Ferrari, Definitive Guide to DAX, The: Business intelligence for Microsoft Power BI, SQL Server Analysis Services, and Excel, Microsoft, 2019.
Additional
[1] R. Kimball, J. Caserta: The Data Warehouse ETL Toolkit. Wiley, 2004

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	32	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	43	1,50