ODESSA I.I. MECHNYKOV NATIONAL UNIVERSITY
FACULTY OF MATHEMATICS, PHYSICS AND INFORMATION TECHNOLOGIES
DEPARTMENT OF MATHEMATICAL SUPPORT OF COMPUTER SYSTEMS

Syllabus of the course "On-line analytical processing systems"

Amount	the total number of: credits – 3.5; hours – 105; content modules - 5
Semester	spring
Days, Time, Place	according to the class schedule
Teacher(s)	Eugene Malakhov, Doctor of Sciences (Tech.), Professor, Head of the Department of Mathematical Support of Computer Systems
Contact phone number	(048)7340723
E-mail	eugene_malakhov@i.ua
Workplace	department of mathematical support of computer systems
Consultations	face-to-face consultations: Monday, 13.00-14.00 online consultations: ZOOM (link is generated at the beginning of classes)

COMMUNICATION

Communication with students will be carried out by e-mail, in the classroom or via ZOOM.

COURSE ABSTRACT

Subject of the study of the course is the main types, structures and models of data, which are the basis of multidimensional data warehouses used in the creation of information systems of operational analytical data processing (OLAP/OLTP), as well as means of implementing such systems.

Course Prerequisites

The course material is based on previously acquired knowledge, practical skills and skills of topics and areas related to algorithms, data structures, relational databases, SQL language. The corresponding courses are taught within the educational program of the first (bachelor) level of higher education in specialty 126 "Information systems and technologies".

Course Post-requisites

This course complements the discipline "Analysis and visualization of huge data sets (Big Data)" in the field of data analysis and processing and is the basis for mastering the following disciplines of the educational and professional master's training program in the specialty 126 "Information systems and technologies": "Professional research practice ", "Performance of master's qualification work".

Purpose of the course is the formation of system knowledge regarding the basic concepts and principles of planning, designing, building, filling and maintaining data warehouses.

Course content

Considered:

- *Concept of OLTP and OLAP systems. Evolution of data warehouses (DWH). DWH concept. Definition of DWH. Advantages of DWH technology. Comparison of OLTP and DWH. Problems of development and maintenance of DWH.*
- *DWH architecture. The main components of DWH and their purpose. Information flows in DWH.*
- *DWH tools and technologies. DBMS for DWH and features of its architecture. Using metadata in DWH. Management and administration tools.*
- *Data windows: general characteristics and connection to DWH. Architecture of data stores. Data store support issues.*
- *DWH design (dimensional modeling, "star", "snowflake" schemes). Nine-step database design methodology for DWH.*

– *Concept of OLAP system, its purpose and functions, areas of OLAP application, basic requirements for OLAP systems. Variants of presentation of multidimensional data, basic analytical operations. OLAP tools. Codd's rules for evaluating OLAP systems.*
– *SQL extensions to support OLAP: operations DECODE, CUBE, MOVINGAVG, MOVINGSUM, RANK...WHEN, RATIONTOREPORT, TERTILE, CREATE MACRO.*
– *Basic concepts of data mining technology. Examples of applications. Data development methods. Data mining tools.*

EXPECTED RESULTS

As a result of studying the course, the student must

know: basic concepts and terminology of data warehouse technology, technologies and areas of application of OLAP tools and data mining methods (Data Mining), the role of data warehouses in decision-making automation systems.

be able: design data showcases and data warehouses, apply modern tools for building data warehouses and analytical data processing.

Competencies that the student receives as a result of studying the course:

– *the ability to develop mathematical, information and computer models of objects and informatization processes.*
– *the ability to use modern data analysis technologies to optimize processes in information systems.*
– *the ability to apply modern models and methods of fuzzy logical inference based on forms of knowledge representation and ways of organizing the search for solutions; design and develop expert systems.*
– *the ability to conduct information analysis and create multidimensional models of subject areas.*

Learning outcomes: upon completion of the course, the student will have skills

– *develop models of information processes and systems of various classes, use methods of modeling, formalization, algorithmization and implementation of models using modern computer tools.*
– *develop and use data repositories, perform data analysis to support decision-making.*
– *use modern fuzzy models, methods and tools of artificial intelligence in decision-making systems, apply intelligent algorithms using fuzzy models to solve artificial intelligence problems.*
– *create optimized pipelines for preparing data for further storage and processing.*

FORMS AND METHODS OF TEACHING

The course will be taught in the form of lectures (36 hours) and laboratory classes (36 hours), organization of students' independent work (48 hours).

The basic training of students is carried out in lectures and laboratory classes.

During the teaching of the course, the following teaching methods are used: verbal (lecture, explanation); face-to-face (Power Point presentation); practical (laboratory works); work with literary sources (independent work of students).