DATABASES FOR CORPORATE INFORMATION SYSTEMS

COURSE SYLLABUS

Code and name of specialty	121 Software Engineering 122 Computer Science 126 Information Systems and Technologies	**Institute**	**Computer Sciences and Software Engineering**
Program name	Software Engineering Computer Science and Intelligent Systems Information Systems Software	**Department**	Software Engineering and Management Information Technologies
Type of program	**Educational and Professional**	**Language of instruction**	**Ukrainian, English**

LECTURER

Sokol Volodymyr Evgenovich volodymyr.sokol@khpi.edu.ua

PhD, Candidate of Engineering Sciences, Associate Professor of Department of Software Engineering and Information Technology Management. Number of scientific and educational publications more than 25 research papers and textbooks (Google Scholar: https://scholar.google.com.ua/citations?hl=ru&user=ShYWpZYAAAAJ; ORCID: https://orcid.org/0000-0002-4689-3356; Scopus: https://www.scopus.com/authid/detail.uri?authorId=57194776447)
Leading lecturer of the courses: Development of corporate information systems (part 1 and part 2) *(Bachelors) (Ukrainian, English)*
Databases for corporate information systems (part 1 and part 2) *(Bachelors) (Ukrainian, English)*

GENERAL DESCRIPTION OF THE COURSE

Summary	The course “Databases for corporate information systems” is an optional course in the profiled discipline package 03 “Innovation campus” of the specialties 121 “Software Engineering”, 122 “Computer Science”, and 126 “Information Systems and Technologies”. It is taught in the fifth semester in the amount of 120 hours (4 ECTS credits), in particular: lectures – 32 hours, laboratory classes – 16 hours, independent work – 72 hours. The course includes1 test. The study of the discipline ends with the test.
Course objectives	Formation of students' in-depth knowledge of the theory and skills of practical database development to solve problems of data storage and processing in the work of large enterprises, corporations and other business structures of any industry and form of ownership.
Types of classes and control	Lectures, laboratory works, control works, self-study. The course ends with a final exam
Term	5

Student workload (credits) / Type of course	4 / Optional	**Lectures (hours)**	32	**Workshops (hours)**	16	**Self-study (hours)**	72
Program	121-GC01. Ability to abstract thinking, analysis and synthesis.						

competences	121-GC 02. Ability to apply knowledge in practical situations. 121-GC 05. Ability to learn and master modern knowledge. 121-GC 06. Ability to search, process and analyze information from various sources. 121-PC19. Knowledge of information data models, the ability to create software for data storage, retrieval and processing. 122-GC1. Ability to abstract thinking, analysis and synthesis. 122-GC2. Ability to apply knowledge in practical situations. 122-GC3. Knowledge and understanding of the subject area and understanding of professional activity. 122-GC6. Ability to learn and master modern knowledge. 122-PC8. Ability to design and develop software using different programming paradigms: generalized, object-oriented, functional, logical, with appropriate models, methods and algorithms of calculations, data structures and management mechanisms. 122-PC9. Ability to implement a multi-tier computing model based on the client-server architecture, including databases, knowledge bases, and data warehouses, perform distributed processing of large data sets on clusters of standard servers to meet the computing needs of users, including cloud services. 126-GC 1. Ability to abstract thinking, analysis and synthesis. 126-GC 2. Ability to apply knowledge in practical situations. 126-GC 3. Ability to understand the subject area and professional activity. 126-GC 5. Ability to learn and master modern knowledge. 126-GC 6. Ability to search, process and summarize information from various sources. 126- GC 8. Ability to evaluate and ensure the quality of work performed. 126-PC 1. Ability to analyze the object of design or operation and its subject area. 126-PC 2. Ability to apply standards in the field of information systems and technologies in the development of functional profiles, construction and integration of systems, products, services and infrastructure elements of the organization. 126-PC 3. Ability to design, develop, debug and improve system, communication and software and hardware of information systems and technologies, the Internet of Things (IoT), computer-integrated systems and system network structure, their management. 126-PC 4. Ability to design, develop and use tools for the implementation of information systems, technologies and infocommunications (methodological, informational, algorithmic, technical, software and others). 126-PC 10. Ability to apply methodologies, technologies, and tools to manage the life cycle processes of information and software systems, information technology products and services according to customer requirements. 126-PC 12. Ability to manage and use modern information and communication systems and technologies (including those based on the use of the Internet).

	126-PC 13. Ability to develop network software that operates based on different topologies of structured cable systems, uses computer systems and data networks, and analyzes the quality of computer networks.

Learning outcomes	Teaching and learning methods	Forms of assessment (continuous assessment CAS, final assessment FAS)
121-PO10. Conduct a pre-project survey of the subject area, systematic analysis of the design object.	Interactive lectures with presentations, discussions, practical classes, teamwork, case method, method of feedback from students, problem-based learning	Written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), collection of data on individual assignments and reporting on research results (CAS), final / semester control in the form of a semester exam, according to the learning process schedule (FAS)
121- PO18. Know and be able to apply information technology processing, storage and transmission of data.	Interactive lectures with presentations, discussions, practical classes, teamwork, case method, research, project training	Written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), collection of data on individual assignments and reporting on research results (CAS), final / semester control in the form of a semester exam, according to the learning process schedule (FAS)
122-PLO9. Develop software models of subject areas, choose a programming paradigm from the standpoint of convenience and quality of its application to implement methods and algorithms that solve problems in the computer science field.	Interactive lectures with presentations, discussions, practical classes, teamwork, case method, research, problem-based learning	Written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), collection of data on individual assignments and reporting on research results (CAS), final / semester control in the form of a semester exam, according to the learning process schedule (FAS)
122-PLO10. Use tools for developing client-server applications, design conceptual, logical, and physical models of databases, develop and optimize database queries, create distributed databases, repositories and showcases of databases, and	Interactive lectures with presentations, discussions, practical classes, teamwork, case method, research, problem-based learning	Written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), collection of data on individual assignments and reporting on research results (CAS), final / semester control in the form of a semester exam, according to the learning process schedule (FAS)

knowledge bases, including those based on cloud services, using web programming languages.		
126-PLO 3. To use basic knowledge of informatics and modern information systems and technologies, programming skills, technologies of safe work in computer networks, methods of creation of databases and Internet resources, technologies of development of algorithms and computer programs in high-level languages with application of project-oriented programming to solve problems of design and use of information systems and technologies.	Interactive lectures with presentations, discussions, practical classes, teamwork, case method, research, problem-based learning	Written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), collection of data on individual assignments and reporting on research results (CAS), final / semester control in the form of a semester exam, according to the learning process schedule (FAS)
126-PLO 5. Argue the choice of software and hardware for the creation of information systems and technologies based on the analysis of their properties, purpose and technical characteristics, taking into account the requirements for the system and operating conditions; have the skills to debug and test software and hardware of information systems and technologies.	Interactive lectures with presentations, discussions, practical classes, teamwork, case method, research, problem-based learning	Written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), collection of data on individual assignments and reporting on research results (CAS), final / semester control in the form of a semester exam, according to the learning process schedule (FAS)
126-PLO 6. Demonstrate knowledge of the current level of information systems technology, practical skills of programming and use of applied and specialized computer systems and environments for their	Interactive lectures with presentations, discussions, practical classes, teamwork, case method, research, problem-based learning	Written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), collection of data on individual assignments and reporting on research results (CAS), final / semester control in the form of a

implementation in professional activities.		semester exam, according to the learning process schedule (FAS)
126-PLO 7. Justify the choice of technical structure and develop appropriate software that is part of information systems and technologies.	Interactive lectures with presentations, discussions, practical classes, teamwork, case method, research, problem-based learning	Written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), collection of data on individual assignments and reporting on research results (CAS), final / semester control in the form of a semester exam, according to the learning process schedule (FAS)

ASSESSMENT AND GRADING

Ranges of points corresponding to grades

Total score (points) for all types of learning activities	ECTS grading scale	The national grading scale
90-100	A	excellent
82-89	B	good
74-81	C	
64-73	D	satisfactory
60-63		
35-59	FX	Unsatisfactory (with the exam retake option)
0-34	F	Unsatisfactory (with mandatory repetition of the course)

Allocation of grade points

100% **final assessment** in the form of test (30%) and current assessment (70%).

70% **continuous assessment**:

- 45% assessment of tasks in laboratory work (15% for each work);
- 25% intermediate control (control tasks and individual tasks)

Course policy

Follow the rules of the University internal regulations. Take an active part in the learning process. Students must attend all classes according to the study schedule and adhere to the norms of academic ethics. To study the course, students need to have their personal computer and (or) use computers of the computer center at the department. Students must work with compulsory and recommended reading, including Internet resources. Students must complete and submit all laboratory works during the semester in which the course is taught, before the examination session. The final assessment is not carried out without the personal presence of students.

COURSE STRUCTURE AND CONTENT

Semester 1

Topic 1	Basic concepts of databases for corporate information systems	**Laboratory work** 1	Subject area analysis and development of a system of business rules	**Self-Study**	DBMS environment components

Topic 2	Roles related to the design, development, use of databases in corporate information systems	**Laboratory work** 2	Development of a database model in IDEF1X notation		Advantages of using a three-level architecture
Topic 3	Database management systems architectures	**Laboratory work** 3	Implementation of the developed data model in the DBMS of the student's choice		Relational algebra operators
Topic 4	Databases Schemas in corporate information systems				The role of transactions in data storage
Topic 5	Database languages				
Topic 6	Data models				
Topic 7	Fundamentals of data modeling in corporate information systems				
Topic 8	Use of SQL language in corporate information systems				
Topic 9	Transaction support in corporate information systems				

RECOMMENDED READING

Compulsory

1. Connolly, T., Begg C. (2014). Database Systems: A Practical Approach to Design, Implementation, and Management. Pearson. 6th edition, 1440 p.
2. Elmasri, R., Navathe Sh. B. (2016). Fundamentals of Database Systems. Pearson, 1273 p.
3. Kleppmann, M. (2017). Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable and Maintainable Systems. O'Reilly Media, 616 p.
4. Blokdyk, G. (2021). Database Management Systems A Clear and Concise Reference Paperback. 5STARCooks, 316 p.
5. Powell, G. (2019). Database Modeling Step by Step. Auerbach Publications, 268 p.
6. Mullin, S. (2021). Coding Activities for Building Databases with SQL (Code Creator). Rosen Publishing Group, 64 p.
7. Dietrich, S. W. (2021). Understanding Databases: Concepts and Practice, 1st Edition. Wiley, 320 p.

Recommended

8. Hameurlain, A., Tjoa, A. M., Amann, B. Goasdoué, F. (2021). Transactions on Large-Scale Data- and Knowledge-Centered Systems XLIX: Special Issue on Data Management. Principles. Technologies and Applications (Lecture Notes in Computer Science, 12920). Springer, 140 p.
9. Wallis, I. (2021). Data Strategy: From definition to execution. BCS. The Chartered Institute for IT, 316 p.
10. SQL Tutorial [Electronic resource]. Access mode : https://www.w3schools.com/sql/

ACADEMIC INTEGRITY

Students are expected to adhere to the Code of Ethics of Academic Relations and Integrity of NTU “KhPI”.

The content of this syllabus is consistent with the course program.