Syllabus

Course Program

Distributed computing and cloud services

Specialty
122 – Computer Science

Institute
Institute of Computer Science and Information Technology

Educational program
Computer Science and Intelligent Systems

Department
Software Engineering and Management Intelligent Technologies (321)

Level of education
Bachelor's level

Course type
Special (professional), Mandatory

Semester
5

Language of instruction
English, Ukrainian

Lecturers and course developers

Serhii Shevchenko

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Candidate of Technical Sciences, Professor of NTU "KhPI", Professor of the Department of Software Engineering and Information Technology Management of NTU "KhPI".
Experience of pedagogical work - 35 years.

Author of about 120 scientific and educational works, (https://www.scopus.com/feedback/author/reviewAuthorProfile.uri?authorIds=57210817349; https://orcid.org/*0000-0002-3831-5425*).

Leading lecturer in the following disciplines: " Fundamentals of Computer Networks", "Computer Networks", " Distributed computing and cloud services ".
General information, number of publications, main courses, etc.
More about the lecturer on the department's website

General information

Summary

The course " Distributed computing and cloud services " is an educational discipline from the cycle of special mandatory training in specialty 122 " Computer science and intelligent systems". It is in the fifth semester with lectures, laboratory classes and independent work taught. There are no individual tasks. The study of the discipline ends with a test.

Course objectives and goals

The formation of students of the necessary theoretical knowledge and practical skills in the course "Distributed computing and cloud services" with an analysis of their current state, the principles of building distributed information processing systems based on organization and the use of data transmission subsystems to ensure the qualitative and quantitative performance characteristics of high-performance distributed information systems of various purpose, their functioning and development forecasting.

Format of classes

Lectures, laboratory classes, consultations, self-study. Final control in the form of a credit.

Competencies

GC1. Ability to think abstractly, analyze and synthesize.
GC2. Ability to apply knowledge in practical situations.
GC3. Knowledge and understanding of the subject area and understanding of professional activities.
GC6. Ability to learn and master modern knowledge.
GC9. Ability to work in a team.
PC9. Ability to implement a multi-level computing model based on client-server architecture, including databases, knowledge and data warehouses, to perform distributed processing of large data sets on clusters of standard servers to meet the computing needs of users, including cloud services.
PC12. Ability to ensure the organization of computing processes in information systems for various purposes, taking into account the architecture, configuration, performance indicators of operating systems and system software.
PC16. Ability to implement high-performance computing based on cloud services and technologies, parallel and distributed computing in the development and operation of distributed parallel information processing systems.

Learning outcomes

PLO10. To use tools for developing client-server applications, design conceptual, logical and physical models of databases, develop and optimize queries to them, create distributed databases, data warehouses and showcases, knowledge bases, including cloud services, using web programming languages.
PLO16. Perform parallel and distributed computing, apply numerical methods and algorithms for parallel structures, parallel programming languages in the development and operation of parallel and distributed software.

Student workload

The total volume of the course is 90 hours (3 ECTS credits): lectures - 16 hours, laboratory classes - 32 hours, self-study - 42 hours.

Course prerequisites

Fundamentals of computer science and artificial intelligence methods
Operating systems
Computer networks

Features of the course, teaching and learning methods, and technologies

Lectures, laboratory classes, self-study, consultations. Final control in the form of an test.

Program of the course

Topics of the lectures

Topic 1. Construction, characteristics and components of distributed data processing systems.
Purpose of distributed processing systems. Main characteristics. Performance evaluation criteria. Examples of distributed processing systems.
Topic 2. Classification of distributed data processing systems.
Structure of distributed processing systems. Components of distributed data processing systems.
Topic 3. Architecture of distributed processing systems.
Features of the architecture of distributed processing systems. Distributed processing processes. Principles of development of distributed processing systems.
Topic 4. Service-oriented architecture in distributed processing systems.

Concept of SOA. Principles of SOA construction. Service-oriented platforms for executing composite applications in a distributed environment.
Topic 5. Component systems and their construction.
Examples of component software systems. Concept of JavaBeans.
Topic 6. X-Com distributed computing technology.
Subject-oriented application development technologies in distributed environments.
Topic 7. Grid systems.
Grid architecture. Grid standards. Examples of systems.
Topic 8. Cloud computing and services.
Multi-layer architecture of cloud applications. Cloud infrastructure. Cloud technologies. Virtual computing machines. Cloud service platforms.

Topics of the workshops

Practical classes within the discipline are not provided.

Topics of the laboratory classes

Topic 1. Study of the functionality of Google's service-oriented components.
Topic 2. Analysis and use of the MS AZURE cloud services platform.
Topic 3. Use of data flow synchronization tools.
Topic 4. Use of Iaas, Saas, Paas technologies.
Topic 5. Formation of web applications using Google cloud services.
Topic 6. Use of Docker technology.
Topic 7. Creating images using cloud services.
Topic 8. Use of virtual machines from providers of cloud technologies

Self-study

The curriculum does not provide for individual tasks.
Students are recommended additional materials (videos, articles) for independent study and processing..

Course materials and recommended reading

Basic literature

1. Google products. https://workspace.google.com/intl/uk/features/
2. Amazon cloud computing services. https://aws.amazon.com.
3. Microsoft Azure. https://azure.microsoft.com.
4. IBM Cloud Learn Hub. https://www.ibm.com/ru-ru/cloud/learn/.
5. Юрчишин В.Я. Хмарні та грід – технології : навч. посібник. https://ela.kpi.ua/bitstream/123456789/29960/1/Khmarni_ta_grid-tekhnolohii_Konspekt_lektsii1.pdf.

Additional literature

1. IaaS, PaaS, SaaS. https://www.ibm.com/ru-ru/cloud/learn/iaas-paas-saas.
2. Service Oriented Architecture (SOA) Reference Model Public Review Draft 1.0(Feb) / Organization for the Advancement of Structured Information Standards (OASIS). URL: http://www.oasisopen.org/committees/ download.php/16587/wdsoa-cd1ED.pdf.
3. Google services. https://policies.google.com.

Assessment and grading

Criteria for assessment of student performance, and the final score structure

100% final assessment in the form of credit (30%) and current assessment (70%). 30% credit 70% current assessment:
Module №1 (10%)
Module №2 (20%):
1- 8 laboratory works (40%);

Grading scale

Total points	National	ECTS
90–100	Excellent	A
82–89	Good	B
75–81	Good	C
64–74	Satisfactory	D
60–63	Satisfactory	E
35–59	Unsatisfactory (requires additional learning)	FX
1–34	Unsatisfactory (requires repetition of the course)	F

Norms of academic integrity and course policy

The student must adhere to the Code of Ethics of Academic Relations and Integrity of NTU "KhPI": to demonstrate discipline, good manners, kindness, honesty, and responsibility. Conflict situations should be openly discussed in academic groups with a lecturer, and if it is impossible to resolve the conflict, they should be brought to the attention of the Institute's management.
Regulatory and legal documents related to the implementation of the principles of academic integrity at NTU "KhPI" are available on the website: http://blogs.kpi.kharkov.ua/v2/nv/akademichna-dobrochesnist/

Approval

Approved by	08.06.2023	Head of the department Ihor HAMAIUN
	08.06.2023	Guarantor of the educational program Andrii KOPP