DISTRIBUTED COMPUTING AND CLOUD SERVICES

SYLLABUS

Code and name of the specialty	122 – «Computer Science»	**Institute / faculty**	**NTU "KhPI" / computer science**
Name of the program	Working program of the discipline	**Chair**	Software engineering and information technology management
Program type	Educational and professional	**Language learning**	english

Teacher

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General information - scientific degree, academic title, position, number of publications, basic courses …

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. Leading lecturer in the following disciplines: "Computer Circuitry", "Computer Architecture", "Computer Networks", "Fundamentals of Web Technologies", "Distributed computing and cloud services", "Cloud Computing", the textbook in co-authorship is developed: Godlevsky M. D. Formation of strategies of development of corporate computer systems / M. D. Godlevsky, S. V. Shevchenko. - Kharkiv: NTU "KhPI", 2017. (Recommended by the Academic Council of NTU "KhPI") (80% of the author's contribution)

General information about the course

Summary	The organization of distributed computing systems and cloud services, their structure, composition of main components, purpose and use, principles of system management, protocols that support distributed processing, study the features of web technologies for distributed data processing and use of cloud services, analyze issues efficiency of distributed computing and cloud services.
Course objectives	Mastering the theoretical foundations of construction and use of information technologies for the organization of distributed computing processes based on the use of resources of computer networks and cloud technologies for the development of high-performance information systems for applications
Types of classes and control	Lectures, laboratory work, consultations. Final control - test
Term	5

Volume (credits) / Type of course (Required / Selective)	3 / Required e	**Lectures (hours)**	32	**Laboratory classes (hours)**	32	**Independent work (hours)**	26

Program competencies	GC1. Ability to abstract thinking, analysis and synthesis. GC2. Ability to apply knowledge in practical situations. GC3. Knowledge and understanding of the subject area and understanding of professional activity. GC6. Ability to learn and master modern knowledge. GC9. Ability to work in team. 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. PC11. Ability to conduct intelligent data analysis based on methods of computational intelligence, including large and poorly structured data, their operational processing and visualization of analysis results in the process of solving applied problems. PC16. Ability to implement high-performance computing based on cloud services and technologies, parallel and distributed computing in the development and

	maintenance of distributed parallel information processing systems.

Learning outcomes	Teaching and learning methods	Forms of evaluation (current CAS assessment, final FAS assessment)
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 knowledge bases, including those based on cloud services, using web programming languages. PLO12. Apply methods and algorithms of computational intelligence and intelligent data analysis in the tasks of classification, prediction, cluster analysis, search for associative rules using software tools to support multidimensional data analysis based on technologies DataMining, TextMining, WebMining. PLO16. Perform parallel and distributed computations, apply numerical methods and algorithms for parallel structures, parallel programming languages in the development and operation of parallel and distributed software.	Interactive lectures with presentations, discussions, laboratory classes, case method, feedback from students, problem-based learning.	Written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), rapid surveys (CAS), online tests (CAS), final / semester control in the form of a semester test, according to the schedule of the educational process (FAS)

ASSESSMENT AND GRADING

Distribution of points for assessing the success of graduate students

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	E	
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 as a result of Final test (25%) and Continuous assessment (75%).
25% Final test
75% Continuous assessment:
Module №1 (15%)
Module №2 (15%)
Laboratory works (45%)
Laboratory work №1 (5%)
Laboratory work №2 (5%)
Laboratory work №3 (5%)
Laboratory work №4 (5%)
Laboratory work №5 (5%)
Laboratory work №6 (5%)
Laboratory work №7 (7%)
Laboratory work №8 (8%)

Course policy

The policy of the academic discipline is determined by the system of requirements for the study of the discipline, the inadmissibility of omissions, the implementation of the required minimum of educational work; incentives and penalties - accrual or deduction of points. The policy of the discipline is based on the norms of the legislation of Ukraine on academic integrity, the Charter, the provisions of NTU "KhPI".
For violation of academic integrity, students may be held subject to the following academic liability:
• reduction of the results of evaluation of control work, credit;
• re-assessment of control work, credit;
• appointment of additional control individual tasks, tests, tests.
Without the personal presence of the student the final control is not carried out.

The structure and content of the course					
Lecture 1	Building, characteristics and components of distributed data processing systems. Main characteristics. Criteria for evaluating effectiveness. Examples of distributed processing systems..	Laboratory work 1.	Platforms of distributed AWS software systems and MS Azure. Investigation of functionality (PT16).	**Individual work**	Comparison of cloud processing services. Criteria for processing efficiency
Lecture 2	Classification of software systems for distributed data processing. The main components of software systems for distributed data processing.	Laboratory work 2.	Analysis of technologies of distributed computing processes. Tools for synchronizing data streams (PT17)..		Development of applications using cloud services
Lecture 3	Distributed processing processes. Modern architectures of distributed processing systems. Principles of development of distributed processing systems.	Laboratory work 3.	IAAS, SAAS, PAAS technologies analysis.		Formation of levels of classification of cloud services by criteria and functionality
Lecture 4	Distributed databases. Functions of recovery and parallelism. Object-oriented DBMS. Object-oriented data models. Object-oriented database programming languages.	Laboratory work 4.	Formation of the content of the site using Google cloud services (PT16, PT17, PT20).		
Lecture 5	Service-oriented architecture. SOA concept. Principles of SOA construction.	Laboratory work 5.	Docker Technology and Container Management.		
Lecture 6	Service-oriented platforms for executing composite applications in a distributed environment.	Laboratory work 6.	Using images in Docker.		
Lecture 7	Component systems and their structure. Examples of component software systems. JavaBeans concept.	Laboratory work 7.	Creating images using Dockerfile.		
Lecture 8	X-Com distributed computing technology. Distributed data processing in wireless networks. Subject-oriented technologies for application development in distributed environments.	Laboratory work 8.	Using virtual machines AWS and MS AZURE (PT20).		
Lecture 9	Web services as a basis for information services. Construction of Web services and their use as part of distributed processing systems.				
Lecture 10	WSDL standard. SOAP standard. Development of web services standards. Addressing and WS-Addressing. Status of web services and WSRF.				
Lecture 11	Grid systems. Grid architecture. Grid Standards. Globus system. UNICORE system.				
Lecture 12	Parametric models of Grid performance. Architectural and technological aspects of the evolution of Grid systems.				
Lecture 13	Cloud computing. Multilayer architecture of cloud applications. Components of cloud applications.				

	Classification of cloud technologies. Common cloud platforms. Comparison of Grid and Cloud Computing.				
Lecture 14	Cloud services. Cloud infrastructure. Virtual computers. Cloud service platforms.				
Lecture 15	Formation of strategies for the development of distributed information systems. Architecture of design tools. Distributed information systems modeling systems. Riverhead Steelhead software products.				
Lecture 16	Analysis of productivity and reliability of problem-oriented cloud computing environments.				

RECOMMENDED READING

Compulsory

1. Юрчишин В.Я. Хмарні та грід технології Retrieved from: https://ela.kpi.ua/bitstream/123456789/29960/1/Khmarni_ta_grid-tekhnolohii_Konspekt_lektsii1.pdf (Дата звертання: 02.09.2021)
2. Юрчишин В.Я. Ясько. М.М. (2010) Паралельні та розподілені обчислення ДонецькЖ РВВ ДНУ
3. Зайченко Ю. П. (2003) Комп'ютерні мережі Київ: Слово

Recommended

1. IBM Cloud Learn Hub. Retriyeved from: https://www.ibm.com/ru-ru/cloud/learn/ . Date of use: 02.09.2021.
2. IaaS, PaaS, SaaS. Retriyeved from: https://www.ibm.com/ru-ru/cloud/learn/iaas-paas-saas. Date of use: 02.09.2021.
3. BOINC Berkeley Open Infrastructure for Network Computing. Retriyeved from: URL: http://boinc.berkeley.edu/. Date of use: 19.05.2020.
4. Skype. Retriyeved from:URL: http://www.skype.com. Date of use: 02.06.2020.
5. Miller R. Who Has the Most Web Servers? [Electronic resource] / R. Miller. URL: Retriyeved from:http://www.datacenterknowledge.com/archives/2009/05/14/whos-got-the-most-web-servers/. Date of use: 27.09.2020
6. PaaS, DBaaS, SaaS. URL: https://habr.com/ru/company/kingservers/blog/310022/. Date of use: 28.09.2019.
7. Wadiwala R. Cloud Database - DBaaS (Database as a Service) [Electronic resource]. Retriyeved from URL: https://labs.sogeti.com/cloud-database-dbaas-database-as-a-service/. Date of use : 29.09.2020.
8. Hamza Y.A. (2013) Cloud computing security: Abuse and nefarious use of cloud
computing [Text] Int. J. Comput. Eng. Res
9. 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. Date of use: 4.06.2020.
10. Годлевский М. Д., Шевченко. С.В. (2017) Формирование стратегий развития корпоративных компьютерных систем : Харьков : НТУ «ХПИ»,.
11. Гольдштейн А. Б., Гольдштейн. Б. С. (2005) Технология и протоколы MPLS Санкт-Петербург: БХВ-Петербург,.
12. Дикер-Пилдуш Г. (2004) Сети АТМ корпорации CISCO Москва : Вильямс

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.