

## DESCRIPTION/Syllabi of Curricula/Module

<b>Short Name of the University/Country code</b> <b>Date (Month / Year)</b>	<b>DSEA</b> <b>Jan 2019</b>
<b>TITLE OF THE MODULE</b>	<b>Code</b>
Distributed computer systems and networks	<b>P11</b>

<b>Teacher(s)</b>	<b>Department</b>
<b>Coordinating:</b> Olexander Altukhov, PhD <b>Others:</b>	Department of Computer and Information Technology (CIT)

<b>Study cycle</b> <b>(BA/MA)</b>	<b>Level of the module</b> <b>(Semester number)</b>	<b>Type of the module</b> <b>(compulsory/elective)</b>
Master	1st semester (1st year) for Masters	compulsory

<b>Form of delivery</b> <b>(theory/lab/exercises)</b>	<b>Duration</b> <b>(weeks/months)</b>	<b>Language(s)</b>
Lectures, lab	8 weeks	Ukrainian / English

<b>Prerequisites</b>	
<b>Prerequisites:</b> studying the courses: "System programming and operating systems", "Computers and microprocessor systems" and "Organization of Databases and Knowledge"	<b>Co-requisites (if necessary):</b>

ECTS (Credits of the module)	Total student workload hours	Contact hours	Individual work hours
4,5	135	54	81
<b>Aim of the module (course unit): competences foreseen by the study programme</b>			
<p>Students should be able:</p> <ul style="list-style-type: none"> <li>- to analyze computational algorithms and perform their efficient parallelization;</li> <li>-to apply basic knowledge of information technology standards in the development and implementation of information systems and technologies;</li> <li>- to use programming languages, languages for describing information resources, languages of specifications, tools when designing and creating information systems, products and services in the field of information technologies;</li> <li>- to solve problems of scalability, support of remote components and interaction of different software platforms in the distributed information systems of the enterprise;</li> <li>- to apply technologies of the distributed systems and to program parallel implementation of algorithms for solving technical problems;</li> <li>- to use hardware of modern information processing systems, computer systems of various purpose.</li> </ul>			
Learning outcomes of module (course unit)	Teaching/learning methods (theory, lab, exercises)	Assessment methods (written exam, oral exam, reports)	
<p><b>Knowledge:</b></p> <ul style="list-style-type: none"> <li>- Scientific and methodological foundations and standards in the field of information technologies, ability to apply them during the development and integration of systems, products and services of information technologies.</li> <li>- General information about hardware technologies of parallel and distributed computing systems such as multi-core processors, multiprocessor platforms, external computing devices, classrooms, supercomputers, etc.</li> <li>- The current state of the development of technologies of parallel computing and distributed systems in Ukraine and in the world.</li> <li>- Basic principles of designing and implementing parallel computing algorithms.</li> <li>- Architecture and standards of component models, communication tools and distributed computing, ability to solve scalability problems, support remote components and interaction of different</li> </ul>	<p>Work with the lecture notes as well as on the available fundamental subject literature</p>	<p>Knowledge test</p>	

<p>software platforms in the distributed information systems at the enterprise level.</p>		
<p><b>Skills:</b> The course is aimed at developing student's theoretical and practical skills in the design, construction and exploitation of local networks with the use of modern hardware and software..</p>	<p>Lectures, lab, consultation</p>	<p>Active attendance on lectures, individual project and presentation</p>
<p><b>Competences:</b> Ability for object-oriented thinking, knowledge of object-oriented programming languages and ability to apply this approach. Knowledge of types and understanding of the peculiarities of medical sensors application, topology and characteristics of the wireless sensor network. Mastering of the principles of action and scope of biosensors, converters, their features and limitations, various components of biosensors and biosensor network. Knowledge of the general principles of organization and functioning of operational systems, ability to develop elements of system software. Knowledge of modern theories of the organization of databases and knowledge, methods and technologies of their development, ability to design logical and physical models of data and requests to them. Knowledge of server technologies for creating web applications, ability to apply methods and tools for their design. Knowledge of the architecture and standards of component models, communication tools and distributed calculations, ability to solve scalability problems, support of remote components and interaction of different software platforms in the distributed information systems at the eenterprise level. Knowledge of the concepts of data warehouses, their operational analytical processing and intellectual analysis,</p>	<p>Lectures, practiacal work, consultation</p>	<p>Individual project and presentation</p>

ability to make decisions in various areas of professional activity Knowledge of the features of distributed systems and technologies of parallel computing; ability to apply them in professional activity.		
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Themes	Contact work hours						Time and tasks for individual work		
	Lectures	Consultations	Seminars	Practical work	Laboratory work	Placements	Total contact work	Individual work	Tasks
1.Parallel programming. Construction of parallel computing systems (conveyor, matrix, multiprocessor). Construction of cluster systems	2				4		6	9	Study exam/ complete exercise
2. Construction of cluster systems. Methods of data transmission. Types of parallelism. Switching and synchronization in distributed systems. Programming of parallel computations on heterogeneous networks of computers in mpC language.	2				4		6	9	Study exam/ complete exercise
3. Wireless distributed sensor network. The basic principles of functioning of a distributed network of many sensors and actuators. Technologies for creating a wireless distributed sensor network. Types of nodes of a wireless distributed sensor network. Scopes of a wireless distributed sensor network. Obtaining medical data (readings of patients) with the help of a wireless distributed sensor network.	2				4		6	9	Study exam/ complete exercise

4. Communicative, collective, global computing operations over distributed data. Remote Procedure Calling (RPC) and Remote Application Methods (RMI).	2			4		6	9	Study exam/ complete exercise
5. Parallel transformations of arithmetic expressions. Basic algorithms for parallel calculations. Parallel methods for solving SLR. Parallel methods for solving systems of nonlinear equations.	2			4		6	9	Study exam/ complete exercise
6. Efficiency of the methods of parallel computing in solving the nonlinear Cauchy problem for ZDR. Parallel methods for numerical solving of hard ZDD and their implementation in multiprocessor structures.	2			4		6	9	Study exam/ complete exercise
7. Grid technology. The basic components of Grid and resources. Organization and management of resource distribution (WSRF, GRAM, CONDOR).	2			4		6	9	Study exam/ complete exercise
8. Grid and databases. Management of Grid Environments. File system security. Certificate of public keys. System of function support: logging service for task performing.	2			4		6	9	Study exam/ complete exercise
9. Grid-portal for users' access to Grid resources and applications. Grid applying.	2			4		6	9	Study exam/ complete exercise
<b>Total</b>	<b>18</b>			<b>36</b>		<b>54</b>	<b>81</b>	

Assessment strategy	Weight in %	Deadlines	Assessment criteria
Written theory exam	40%	during the semester / exam	good response to the questions

Practical exam on a computer	60%	during the semester / exam	the work is done completely without mistakes or minor errors
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Author	Year of issue	Title	No of periodical or volume	Place of printing. Printing house or internet link
<b>Compulsory literature</b>				
Christel Baier, Luís Caires	2018	Formal Techniques for Distributed Objects, Components, and Systems		Springer International Publishing, ISBN 978-3-319-92611-7, 978-3-319-92612-4
Giancarlo Fortino, A.B.M. Shawkat Ali, Mukaddim Pathan, Antonio Guerrieri, Giuseppe Di Fatta	2018	Internet and Distributed Computing Systems		Springer International Publishing, ISBN 978-3-319-97794-2, 978-3-319-97795-9
Magnús M. Halldórsson (auth.), Paola Flocchini, Jie Gao, Evangelos Kranakis, Friedhelm Meyer auf der Heide (eds.)	2014	Algorithms for Sensor Systems: 9th International Symposium on Algorithms and Experiments for Sensor Systems, Wireless Networks and Distributed Robotics, ALGOSENSORS 2013, Sophia Antipolis, France, September 5-6, 2013, Revised Selected Papers		Springer-Verlag Berlin Heidelberg, ISBN 978-3-642-45345-8, 978-3-642-45346-5
<b>Additional literature</b>				
Ornela Dardha	2016	Type Systems for Distributed Programs: Components and Sessions		Atlantis Press, ISBN: 978-94-6239-203-8