



Національний університет
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Ministry of Education and Science of Ukraine
National University of Water and Environmental Engineering
Educational and Scientific Institute of Automation, Cybernetics
and Computing
Department of Applied Mathematics

APPROVED

**Vice-Rector for Scientific and
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Educative work**

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Національний університет водного господарства та природокористування

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WORK PROGRAM
EDUCATIONAL DISCIPLINE
" Operating Systems "

Specialty 113 "Applied Mathematics"
Specialty 121 "Software Engineering (Internet of Things)"
Specialty 122 "Computer Sciences"

Rivne – 2019

Work program of the academic discipline "Operating systems" for applicants of higher education of the first (Bachelor) level in specialties: 113 "Applied mathematics", 121 "Software engineering (Internet of things)", 122 "Computer sciences", full-time and part-time study / Zubyk Y. Y., Zubyk L. V. - Rivne: NUWEE, 2019. – 11 p.

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The work program was approved at the meeting of the Applied Mathematics Department on _____, 2019, protocol No .

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Approved by a scientific-methodical commission on a specialty 113 "Applied Mathematics". Protocol № 4 from 28.01.2019.

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Approved by a scientific-methodical commission on a specialty 121 "Software Engineering (Internet of Things)". Protocol № 4 from 28.01.2019.

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Introduction

The work program of the academic discipline "Operating Systems" is an integral part of the normative and methodological provision of the educational process in the fields of knowledge 11 "Mathematics and Statistics", 12 "Information Technologies".

The program was compiled in accordance with the standard of education for bachelor's degree in specialty 113 "Applied Mathematics", 121 "Software Engineering (Internet of Things)", 122 "Computer Science". Knowledge and skills from "Operating Systems" will help students to master the competencies of the specialized disciplines, will be needed during the course of industrial and pre-diploma practice, will help to successfully write and protect the graduation degree.

Abstract

The program of the academic discipline "Operating Systems" involves studying the methods of working with modern software, a systematic approach to solving engineering and technical problems with the help of a PC, the search and processing of information using modern technology.

Teaching of the discipline "Operating Systems" will provide the following learning outcomes: to apply theoretical, methodical and practical approaches for solving professional problems; search, selection and systematization of necessary data with the use of information systems and technologies in applied fields.

Keywords: operating systems, software, information technologies, file systems, process, system calls.



1. Description of the discipline

Indicator Names	Branch of knowledge, specialty, specialization, level of higher education	Characteristics of the discipline	
		Full-time Tuition	Extramural form of training
Number of credits ECTS - 5	Branch of knowledge - 11 "Mathematics and Statistics" 12 "Information Technologies"	<i>Normative</i>	
		Year of training – 1, Semester – 1	
Modules - 1 Semantic modules – 2	Specialty – 113 "Applied Mathematics" 121 "Software Engineering (Internet of Things)" 122 "Computer Science" Lectures	Lectures	
		28 hours	2 hours
Total number of hours – 150		Laboratory works	
		28 hours	14 hours
		Self-dependent works	
		94 hours	138 hours
Weekly hours: in classroom - 4	Level of higher education - first (Bachelor)	Type of control: exam	

Note: the ratio of the number of hours in classroom to independent work for full-time study forms is 37% to 63%.

2. Purpose and tasks of the discipline

The purpose of the course is to acquire knowledge and systematic thinking about the organization of operating systems, and get basic skills in using the operating system tools to manage the hardware and software part of the computer; obtaining the skills to draw correct conclusions from the information received, preparing students for the use of the acquired knowledge and skills in studying special subjects and solving practical problems.

The task of studying the course is theoretical and practical training of future specialists on the use of modern software and information technologies, which allow to effectively apply the basic provisions of

the theory of operating systems in the organization of the effective interaction of all elements of the computer system.

According to the requirements of the educational-professional program as a result of the study of the discipline the applicant must

know:

- architecture of the modern PC;
- character and specificity of the main tasks, considered in the discipline "Operating systems";
- architecture of computing systems;
- structure of operating systems and software;
- methods for controlling computer operation by means of operating systems;
- principles of software development of the computer;
- a systematic approach to setting up and solving tasks using a PC;

be able:

- adjust the quality work of the computer by means of operating systems;
- apply the studied operating systems and their main components to solving practical problems;
- use POSIX commands to work in command mode;
- configure POSIX operating systems;
- install operating systems;
- use the means of interaction between processes;
 - use resource management tools.

3. Program of the discipline

Semantic module 1. Introduction to operating systems

Topic 1. Introduction. Fundamentals of Computer Technology and Software

Information bases of computer equipment. Purpose, generation and architecture of the PC. PC software. Operating systems and their classification

Topic 2. Fundamentals for the construction of disk operating systems

The structure and components of disk operating systems (DOS). Assignment of components. DOS address space. Configuration DOS. The main DOS commands

Topic 3. Organization of file systems

Organization of disk storage. Logical organization of the file system. Productivity and reliability of file systems

Topic 4. Processes and resources of the OS

The concept of process, resource. Process states, processes transitions from state to state. Types of resources, resource planning and management. The core of the OS. Interrupt processing. OS hierarchy

Topic 5. Asynchronous parallel processes

Synchronous and asynchronous interaction of processes. Critical areas. Mutually exclusive. Primitives for mutually exclusive. The task of the "hungry philosopher". Dekker's algorithm. Semaphores

Semantic module 2. Modern operating systems

Topic 6. UNIX family operating system

Concept and principles of construction. Content, structure and mechanisms of OS implementation. Unix kernel. Events, signals, program channels. Memory management. File system. Organization of input-output. User work in OS Unix

Topic 7. OS Windows family

Concept and principles of construction. Content, structure and mechanisms of implementing MS Windows different versions. Levels of OS protection. Distribution of OS address space. Windows registry. Windows software. Windows Network Tools

Topic 8. Architecture OS. Interrupts

Hardware dependence and OS portability. Multilayer OS structure. Micronuclear architecture. Multiprocessor processing. Purpose and types of interruptions. Interrupt mechanism, program interruptions. Dispatching interrupts in the OS. System calls

Topic 9. OS security. Prospects for the development of the OS and their architecture

Estimation of OS reliability. OS protection from external unauthorized interference. Security and confidentiality of information. Data cryptography. Hardware protection for applications and data. Prospects for the development of the OS and their architecture



4. Structure of the discipline

The names of meaningful modules and topics	Number of hours									
	full-time education					external form of education				
	Total	Lectures	Lab. works	Practice	Self-dependent works	Total	Lectures	Lab. works	Practice	Self-dependent works
Semantic module 1. Introduction to operating systems										
Topic 1. Introduction	16	4	2		10	16	1			15
Topic 2. Fundamentals for the construction of disk operating systems	20	4	4		12	20		2		18
Topic 3. Organization of file systems	14	2	2		10	14		2		12
Topic 4. Processes and resources of the OS	20	4	2		14	20	1	2		17
Topic 5. Asynchronous parallel processes	14	2	2		10	14				14
Semantic module 2. Modern operating systems										
Topic 6. UNIX family operating system	26	4	8		14	26		6		20
Topic 7. OS Windows family	20	4	4		12	20		2		18
Topic 8. Architecture OS. Interrupts	10	2	2		6	10				10
Topic 9. OS security. Prospects for the development of the OS and their architecture	10	2	2		6	10				10
Total	150	28	28		94	150	2	14		134



5. Topics of laboratory works

№	Semantic modules	Number of hours
1.	Study of safety measures in the laboratory of the PC. Familiarize yourself with basic PC devices. BIOS and the Setup program. Running a PC to work	2
2.	Working with a virtual machine. Install MS DOS	4/2*
3.	Working with the MS DOS file system. Utilities and applications for MS DOS	2/2*
4.	Processes and resources. Configuring MS DOS. Command files	2/2*
5.	Asynchronous parallel processes	2
6.	OS Unix-family. Install Linux. Basics of working with the Linux file system. The main system administrator commands in Linux OS. User work on Linux OS	8/6*
7.	OS Windows family. Install and configuring of OS Windows	4/2*
8.	Optimization of Windows software. Work with the registry. Interrupts	2
9.	OS protection and information protection. Security and reliability of the network	2
Total		28/14*

* - for applicants of correspondence course of study

6. Self-dependent work

Distribution of hours of self-dependent work for full-time students:

- preparation for classroom lessons – 0,5 h / 1 h occupy;
- preparation for control measures - 6 h for 1 ECTS credit;
- elaboration of separate topics of the program or parts of topics, that not are present at the lectures.

6.1. Tasks for self-dependent work

№ з/п	Name of topic	Number of hours	
		Full-time	Part-time form
1.	Information bases of computer equipment. Virtual machines	15	15
2.	Operate memory. Download applications	16	25
3.	Linux operating systems	16	34
4.	Administration of Windows	15	20
5.	OS security	16	20
6.	OS of portable computers and mobile devices	16	20
Total:		94	134

7. Methods of training

In the teaching of discipline, informational and illustrative and problem-based teaching methods are used with the use of:

- modern computer technology;
- lectures using projective material;
- compilation of algorithms of computational processes;
- handout material (visibility) is used to form students in systems thinking, memory development;
- discussion of problematic issues;
- provocative questions are asked;
- implementation of individual teaching and research tasks.

8. Methods of control

The following methods for assessing knowledge are used to determine the level of assimilation of learners:

- current testing after studying each module;
- assessment for preparation for laboratory work;
- assessment for self-dependent work;
- assessment for the implementation and protection of individual tasks;
- evaluation of final control (exam).



100-point grading scale is used to diagnose knowledge.

9. Distribution of points awarded to applicants

Current testing and self-dependent work									Final test (exam)	Total
Content module № 1					Content module № 2					
T1	T2	T3	T4	T5	T6	T7	T8	T9	40	100
2	8	8	8	8	12	8	4	2		

Scale of evaluation

Total points for all types training activities	Score on a national scale
	for the exam
90–100	perfectly
82–89	fine
74–81	
64–73	satisfactorily
60–63	
35–59	unsatisfactory with the possibility of re-assembly
0–34	unsatisfactorily with compulsory repeated study of discipline

10. Methodological ware of discipline

Methodical ware of the academic discipline "Operating systems" includes:

- Interactive complex of teaching and methodological ware of the discipline (ICTMWD);
- reference abstract of the lectures on the paper carrier;
- reference summary of lectures on electronic media;
- printed materials;
- Bachelor's education standards;



Gladka O. M., Karpovich I. M., Zubyk L. V. Methodical instructions for the execution of laboratory works on the discipline "System software" for students of the specialty "Computer Science and Information Technologies". Ch. I. (04-05-05). Rivne: NUWEE, 2017. URL: <http://ep3.nuwm.edu.ua/id/eprint/5283> (Date of view: 28.08.2018).

11. Recommended books

Basic

1. Silberschatz A., Galvin P. B., Gagne G. John Wiley&Sons, 2009. 971 p. [in English]
2. Tanenbaum A. S., Bos H. Modern operating systems. Amsterdam: Pearson Education, 2015. 1137 p. [in English]
3. Гордеев А. В. Операционные системы. СПб. : Питер, 2004. 416 с.
4. Шеховцов В. А. Операційні системи. К. : Видавнична група BHV, 2005. 576 с.

Additional

1. Армстронг Дж. Секреты UNIX. М. : Изд. дом "Вильямс", 2001. 1072 с.
2. Гук М. Аппаратные средства IBM PC. Энциклопедия СПб : Питер Ком, 1999. 816 с.
3. Иртегов Д. В. Введение в операционные системы. СПб : БХВ-Петербург, 2002. 624 с.
5. Стахнов А. А. Сетевое администрирование Linux. СПб : БХВ-Петербург, 2004. 480 с.
6. Таненбаум Э. Современные операционные системы. СПб : Питер, 2015.1040 с.

12. Information resource

The structure of information resources of the discipline includes:

1. The Standard of the Supreme World on the specialty 113 "Applied Mathematics" for the first level of higher education.
2. National Library by V. I. Vernadsky URL: <http://www.nbu.gov.ua/> (Date of view: 28.08.2018)
3. Regional Scientific Library (Korolenko Maidan, 6, Rivne, Ukraine, 33000) URL: <http://www.lib.rv.ua/> (Date of view: 28.08.2018)
4. Scientific library of NUWEE (Oleksy Novaka St., 75, Rivne, Ukraine, 33018) URL: <http://www.nuwm.edu.ua/naukova-biblioteka> (Date of view: 28.08.2018)



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5. Electronic resource hosting in the digital repository URL:
<http://www.ep3.nuwm.edu.ua/> (Date of view: 28.08.2018)



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