

Ministry of Education and Science of Ukraine  
Rivne State University of Humanities



**PROFESSIONAL EXAMINATION PROGRAM  
WITH SPECIALTY 015.39 "PROFESSIONAL EDUCATION (DIGITAL  
TECHNOLOGIES)"  
for entrants to study for a master's degree  
based on NRK6, NRK7**

Approved by the Academic Council of the Faculty of Mathematics and Informatics  
Protocol No. 3 dated March 27, 2024.

Head of the academic council  
of the Faculty of Mathematics and Informatics  Yuriy MAKSYMISEV

Approved by the educational and methodological commission of the Faculty of Mathematics and  
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**The professional test program in the specialty 015.39 "Professional education (Digital technologies)" for entrants to obtain the degree of higher education "Master" on the basis of the degree (educational and qualification level) of bachelor, specialist, master /**  
Compilers: I.S. Voytovych., G.O. Shlikhta, N.V. Polyukhovich – Rivne: RDSU, 2024 . - 14 p.

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The professional test program contains requirements for the level of training of entrants , proposed questions that reveal the content of the professional training of bachelors when entering the educational and professional program of the master of the field of knowledge 01 Education/Pedagogy in the specialty 015.39 Vocational education (Digital technologies) , characterized criteria for evaluating the answers of entrants in the professional test, recommended sources for independent preparation and in-depth familiarization with program materials.

Considered at a meeting of the department of information and communication technologies and methods of teaching computer science (protocol No. 3 dated March 26, 2024 r.)

**CONTENT**

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## EXPLANATORY NOTE

The program of the professional entrance test for obtaining a master's degree in the specialty 015.39 "Professional education (Digital technologies)" consists of an explanatory note, which reveals the purpose of the entrance test, the requirements for the level of preparation of the entrant, the procedure for conducting the entrance test, the procedure for evaluating the answers of entrants; content of topics and questions of the entrance exam; criteria for evaluating entrants' answers; a list of recommended literature and electronic resources is provided; the norms of time allotted for passing the entrance test are indicated. This test is a component of the holistic educational process in the institution of higher education and is aimed at evaluating the professional knowledge and skills of the entrant in the field of professional education and digital technologies.

**The purpose of the professional entrance test** is to check the level of theoretical and practical training of applicants on the basis of a bachelor's degree and to form a ranking list of applicants who are entering training to obtain a master's degree in the specialty 015.39 "Professional education (Digital technologies)", checking the degree of knowledge of information technologies by entrants and software necessary for the professional activity of a teacher in the field of teaching computer disciplines, as well as determining the level of formation of professional competence in the field of computer technologies.

### **Requirements for the preparation of the entrant.**

The entrant must **know** :

- the basics of fundamental disciplines in the volume necessary for solving educational, educational, scientific-methodical and organizational-practical actions;
- the main historical stages, problems of the development of IT technologies, their functions as an organic part of the social system of society;
- theory and methodology of professional training;
- functions and systems of planning and control in professional education;
- theoretical and methodological foundations of the organization of the educational process; pedagogical control and accounting of the educational process.

The entrant must **be able to** :

- to use the acquired knowledge of the theory and methodology of professional training when solving pedagogical, educational, scientific-methodological tasks, taking into account the age and individual characteristics of students of general secondary education institutions and vocational and technical educational institutions, professional lyceums and colleges; plan, organize and carry out work on teaching computer disciplines;
- use theoretical knowledge and practical skills to solve IT problems in the professional activity of an engineer-pedagogue;
- plan, organize work in various areas of professional activity;
- use modern regulatory, legal, pedagogical, scientific methods of teaching in professional activities;
- carry out planning and management in the specified spheres of activity.

The entrance test makes it possible to establish the level of readiness of the entrant to work in various areas of professional activity: teacher of computer disciplines in institutions of general secondary education, vocational and technical education institutions, professional lyceums and colleges, employee of institutions who manages or carries out educational work.

### **The procedure for conducting the entrance test.**

The entrance test is conducted according to the schedule drawn up by the admissions committee of the Rivne State Humanitarian University.

Entrants are admitted to the entrance test on the condition that they have a sheet of the results of the entrance tests and an identity document (passport).

The professional test is conducted in oral form, which involves providing answers to the questions on the examination tickets. The entrant receives only one set of examination tasks, replacement of tasks is not allowed. Examination tickets are drawn up in accordance with this

program, printed on special forms according to the established model and approved by the head of the admissions committee of the Rivne State Humanitarian University.

During the professional test, the entrant has the right to ask the examiners to clarify the conditions of the tasks. Instead, the entrant is not allowed to use third-party sources of information (electronic, printed, handwritten) and to violate the procedure of passing the professional test, which may be the reason for removing the entrant from the entrance tests.

Oral answer sheets of the appropriate sample are used for writing down answers to exam tasks. After the entrant enters the answer to the specified sheet, he puts his signature under it, which is confirmed by the signatures of the chairman and examiners of the professional certification commission.

Retaking entrance exams is not allowed.

The time allotted for conducting entrance tests in oral form is 0.25 hours. per entrant.

**The procedure for evaluating the answers of entrants.**

The assessment of the entrants' answers to the entrance test is carried out by members of the professional certification commission, appointed in accordance with the order of the rector, on a scale of grades from 1 to 200 points. The basis for forming an assessment is the correctness, logic, depth of the answer, the ability to analyze problems related to the content of the answer, to make independent assessments and decisions on solving such problems.

## CONTENTS OF THE ENTRANCE TEST

### 1. TEACHING METHODOLOGY OF COMPUTER DISCIPLINES

#### 1.1. PROFESSIONAL TRAINING METHODOLOGY

1. Formation of professional pedagogy as a science. The main tasks of didactics. Didactic principles of professional training.
2. Characteristics of specialty, profession and qualification. The main professional groups that are included in the list of professions.
3. Industry standard of professional education (by specialty). List and coordination of specialties and levels of education (specialist training).
4. Professional competences of an engineer-pedagogue. Types of activity of a teacher of professional training.
5. Curriculum, its structure. Formation of training plans for specialists. Accounting for the implementation of educational plans and programs.
6. The curriculum, its structure. Principles of curriculum development.
7. Textbook, its functions. Types of textbooks and teaching aids. The concept of the content of professional education. Criteria for selection of training content.
8. Designing the pedagogical process. Preparation of an engineer-pedagogue for classes.
9. The structure and basic requirements for conducting a vocational training class. Organization of students' work in the conditions of vocational education institutions.
10. Means, forms and methods of professional training, their classification.
11. The main functions of professional training. Planning professional training. Reporting of the teacher of professional training.
12. Accounting of the success of students in vocational training institutions. Evaluation criteria of practical works. Methods of testing the knowledge, abilities and skills of students in vocational training institutions.
13. Production practice, its organization and implementation.
14. The work of the methodical committee of teachers of professional training. Pedagogical council of a professional education institution: planning its work, solving the main methodological issues. Methodical work of the professional education institution, its tasks and forms of implementation.
15. Rights and responsibilities of a vocational teacher. Increasing the professional level and pedagogical skill of the vocational training teacher. Certification of a vocational training teacher.

#### 1.2. METHODS OF LEARNING INFORMATICS (COMPUTER DISCIPLINES)

1. The subject of computer science teaching methods and its place in the system of professional training of an engineer-pedagogue. Professional development of a teacher.
2. Informatics as a science and as a subject in educational institutions. The specifics of the organization of practical works in informatics.
3. Olympiads in programming and information technologies as a means of diagnosing the development and giftedness of students of education.
4. The structure of the computer science curriculum. Compulsory and optional modules of high school.
5. Diagnosis of the results of educational and cognitive activity of education seekers. Pedagogical tests. Test control of computer science knowledge.
6. Development of mental activity and critical thinking by means of informatics.
7. Competency approach in education. Purpose, tasks and principles of computer science education.
8. Tools and forms of learning in computer science classes . Cloud technologies as a means of learning.

9. Methods of teaching informatics. Typology of computer science lessons. Forms of organization of educational and cognitive activities of education seekers.
10. In-depth study of informatics.
11. Basic concepts of the school computer science course and the method of their formation.
12. Methodological features of teaching the subject "Informatics". Content dependencies between computer science course topics.
13. Educational projects and competence tasks in the implementation of knowledge , activity and value components of the computer science curriculum.
14. ICT as an object of study and a means of learning in educational institutions. Information technologies for creating and processing data in a school computer science course.
15. Tools for organizing the educational process using distance learning technologies in informatics.
16. Methods of studying the mandatory module of the computer science curriculum.
17. Methodology for studying the selective module "Graphic Design" in computer science classes in high school.
18. Methods of studying the optional module "Mathematical foundations of informatics" in informatics lessons in high school.
19. Methodology for studying the optional module "Information security" in computer science classes in high school.
20. Methodology for studying the selective module "Web technologies" in computer science classes in high school.
21. Informatics office in an educational institution. Computer science course software and hardware.

## **2. MODERN COMPUTER TECHNOLOGIES**

### **2.1. COMPUTER NETWORKS AND DATA PROTECTION**

1. Purpose and main characteristics of a hub, switch and router in a computer network.
2. IP addressing. Classes of IP addresses. IPv4 and IPv6 protocol.
3. Local, municipal and global computer networks. Types of computer network topology.
4. TCP/IP family of protocols. DNS domain name system. The OSI model.
5. Overview of categories of attacks on computer networks. Methods of organizing information security and data protection.
6. Data encryption. Computer network protection using a firewall .
7. Viruses, worms, Trojan programs. Exploit .
8. Modification attacks. Denial of Service ( DDoS ) attacks. Listening to switched networks ( sniffing ).
9. Information security and data protection procedure and policy.
10. Data protection using specialized software. Data backup ( Data Backup ).

### **2.2. OPERATING SYSTEMS AND SYSTEM PROGRAMMING**

1. Concept of operating system (OS). OS evolution. OS classification. OS functions.
2. OS architecture: kernel, system utilities. Core structure.
3. Flow planning and dispatching. Planning criteria. Non-displacing process and flow planning mode. Main algorithms: queue (FIFO), mechanism for passing small flows forward (SJF), stack (LIFO), three-level scheduling.
4. Flow planning and dispatching. Overriding process and flow planning mode. Algorithms based on the concept of quantization: SJF, cyclic algorithm (RR), multilevel queues with feedback, guaranteed scheduling.
5. Flow planning and dispatching. Overriding process and flow planning mode. Algorithms based on the priority service concept: FIFO, LIFO, priorities by time and name. Relative and absolute priorities. Mixed algorithms.

6. Synchronization of processes and flows. Interlocking. Monitors. Semaphores and mutexes .

7. RAM management. Memory manager. Address spaces. Swapping . Free memory management: using bit matrices; using linked lists.

8. RAM management. Virtual memory. Page organization of virtual memory. Tables of pages. Page replacement algorithms: optimal page replacement algorithm, "second chance", "clock", FIFO. Virtual memory segmentation. Implementation of pure segmentation. Segmentation with paging memory: MULTIX and Intel x86 systems.

9. The concept of a file. File structure and attributes. File access. File operations. Directories. Operations with directories.

10. File systems. The structure of file systems (disk, partition, partition table, Master Boot Record (MBR). File systems: NTFS, FAT, ext2.

11. Input - output (VV) of information. Controllers of explosive devices. Direct memory access ( Direct Memory Access). Ways of managing input - output: software BB; Interrupt-controlled BB; BB using DMA. Levels of software of VV: user-level input-output software, hardware-independent software of operating systems, device drivers, interrupt handlers, hardware.

12. Unix / Linux OS . History of Linux development . Core structure. Linux shells (command, graphical). Linux utilities . Linux system calls . POSIX standard. Implementation of processes and streams in Linux . Memory organization (RAM, ROM) in Linux . I/O in Linux .

13. Windows overview. History of Windows development: MS-DOS, Windows based on MS-DOS, Windows NT. Core structure. Object manager. Linux utilities . Fundamental concepts of Windows. Application interface Win32/64. Implementation of processes and streams in Windows. Organization of memory (RAM, ROM) in Windows. Input-output in Windows.

### **2.3. COMPUTER GRAPHICS**

1. The main fields of application of computer graphics and its components. Features of computer graphics (raster, vector, fractal graphics). Computer graphics software and hardware.

2. The concept of graphic primitives in computer graphics. Attributes of primitives. Mathematical models of graphic scene objects.

3. Color and wavelengths of different colors. The reaction of the eye to the three components of light. Physiology of color. Color attributes. Color models (RGB, CMYK, HSB).

4. Formats of graphic files. Classification of formats. Raster and vector graphics formats. Metafiles and other formats. 3D formats. Multimedia formats.

5. Mathematical foundations of vector graphics.

6. Principles of computer animation. Mathematical foundations of computer animation. Interpolation and basic methods of computer animation.

7. The resolution of graphic images. Estimation of raster resolution. Ruler . Dynamic range.

8. Features of 3D graphics. Modeling of three-dimensional objects. Properties of three-dimensional objects. Geometric and non-geometric properties of objects. Physical properties of materials. Types of spaces.

9. Presentation and means of processing audio and video information. Mathematical models and basic methods of coding video data.

10. Algorithms for compression of graphic information without loss of information and with loss of information.

### **2.4. DATABASES AND DISTRIBUTED INFORMATION AND ANALYTICAL SYSTEMS**

1. Basic concepts of databases (DB). Requirements for database management systems (DBMS). Database architecture. DBMS functions.

2. Concept of data modeling. Hierarchical data model, its advantages and disadvantages. Network data model, its advantages and disadvantages. History of the relational data model.



3. Relational data structure, its advantages and disadvantages. Basic concepts of the relational model: relation, attribute, data type, tuple, domain, key, index. Basic properties of relations. Purpose and types of keys. Connection of tables and types of connections (connections of type 1:M, M:M). Transformation of ER-diagrams into relational schemes: transformation of sets of entities into relations, transformation of ER- connections into relations.

4. Functional dependencies. Normal forms of relational relations. Non-functional dependencies. Designing a scheme of a relational database.

5. History of the SQL language and an overview of its capabilities. Data retrieval tools: querying multiple relations, distinguishing attributes with the same name, union, intersection and difference in a query, subqueries to calculate scalar values, subqueries to determine boolean values, SQL join expressions (Cartesian product, natural join, theta join and outer join), use of aggregate functions, grouping, HAVING clause. Data manipulation tools. Operations on the DB scheme. Virtual tables and indexes. Transactions. Triggers. Additional features.

6. Database design methodology. Stages of database design. ER modeling of the subject area. Elements of the ER model: set of entities, attributes, relationships. Entity and relationship diagrams . Multiplicity of binary connections . Multilateral connections. Convert multi-way relations to binary.

7. The concept of data integrity limitations. Declarative integrity constraints. Dynamic integrity constraints. Semantic integrity constraints. Maintaining integrity in the event of disruptions.

8. Data security. User registration. Access rights management. Mandatory methods of protection. Keeping access logs. Bypassing the protection system.

9. Basic definitions. Logical architecture of distributed databases. Architecture of software and technical tools of distributed DBMS. Distributed data storage. Calculation of distributed queries. Distributed transaction processing.

10. Database based on XML. Database with built-in XML support. Request languages. Publication of the database on the Internet. Working with databases via the Internet.

## **2.5. APPLIED AND WEB PROGRAMMING**

1. The concept of an algorithm, its properties. Graphic representation of algorithms. Basic algorithmic designs.

2. Basic elements of the C++ language. Basic data types of the C++ language. Integer and real data types. Type void . Representation of symbols in the C++ language. The specifics of logical data presentation. Organization of input/output in C++.

3. Basic operations of the C++ language. Unary , binary, ternary operations. Increment and decrement operations . Assignment operation. Arithmetic, logical, bitwise operations.

4. Conditional statement if . The switch selection operator . The early exit operator break . Cyclic operators. Operators for , while , do-while . The break and continue operators .

5. Functions. Function declaration. Passing parameters. The return operator . Pre-initialization of functions. Function overloading. Scope of identifiers. Global and local variables. Memory classes extern , static , auto , register .

6. Features of array implementation in C++. One-dimensional and multidimensional arrays. Declaration, initialization, processing of arrays in C++. Passing arrays to functions.

7. The concept of pointer. Dereferencing operation . Management of dynamic memory allocation using new , delete operations . Pointers and arrays. Dynamic arrays. Arithmetic operations with pointers.

8. Strings in C++. Representation of strings as character arrays. Working with streams with strings. Functions for working with strings from the string.h library .

9. Structures and associations in the C++ language.

10. File input/output in the C++ language.

11. Dynamic data structures. Line list. stack Turn. Doubly linked list. Binary tree.

12. C#'s place in the CLI. C# syntax. C# variable declarations. Simple C# data types. Basic type conversions. Scope and lifetime of variables.

13. Parcel data types. C# Arrays, Strings.
14. Expressions in C#. Operators. Blocks. C# branching operators. C# loops.
15. The concept of class. Class methods. Access specifiers. Encapsulation. Data hiding. Constructors and destructors in C#. Method parameter modifiers. Using the static modifier .
16. Restart operations in C#. Indexers and properties in C#. Imitation. Basic classes. Abstract base classes. Virtual methods.
17. Polymorphism. C# interfaces.
18. Creation of Windows applications in C#. Presentation of graphical user interfaces.
19. C# delegates. Group delegates. Event handlers. Registration of events. Realization of events. Event generation.
20. I/O tools in C#. File I/O in C#. Serialization . Automatic and custom serialization .
21. Collections in C#. Array collection in C#. Lists in C#. Stack collection in C#. Queue collection in C#. Dictionaries in C#. HashSet <T> and SortedSet <T> collections in C#. C# collections that allow concurrency.
22. Database programming in C#.
23. Purpose and use of JavaScript , general information. Placing the script code on the HTML page. Syntax of the JavaScript language . JavaScript Data Types . JavaScript operators . Data input-output in JavaScript .
24. The concept of a function in JavaScript . Global and local variables in JavaScript . JavaScript objects . Arrays in JavaScript . Array class . String class .
25. The concept of an event. The event object in JavaScript . The Image object in JavaScript . Management of images and rollovers by means of JavaScript . JavaScript object events .
26. Description of the DOM. Object Navigator . Browser management. Form processing. The style object in JavaScript .
27. Movement of objects on the page. Delays and intervals. Periodic function calling in JavaScript .
28. Programming paradigms. Object-oriented programming. Step -by -step programming. Reactive programming.
29. web application design architectural template . Client-server architecture. Advantages and disadvantages of client-server architecture. Get and Post data transfer methods .
30. Concepts of Node.js. History of Node.js creation. Features of Node.js. Installing Node.js. Modules in Node.js. NPM package manager.
31. global object in Node.js. Global variables in Node.js. Global objects in Node.js.
32. Node.js event loop. LibUV library . Basics of asynchronous programming. Non-blocking I/O. The concept of an event. Event generator. EventEmitter object .
33. Implementation of server functionality in the http module .
34. Synchronous and asynchronous work with files. Module fs . Reading from a file . Writing to a file. Other functions of working with files.
35. Threads in Node.js. Types of streams. Reading streams. Record streams. Bidirectional flows. Streams of transformation. Riere's method . Stream buffer.
36. Express module . The main features of express . Basics of middleware . Server response methods. Server response codes.
37. Work with databases. The concept of a document database. Work with collections. Database connection. Receiving data. Data Processing. Deleting data.

## **2.6. PC HARDWARE**

1. Main types and characteristics of processors.
2. The main types and characteristics of motherboards.
3. The main types and characteristics of a set of system logic ( chipset ) and features of its structure.
4. Main types and characteristics of RAM.
5. Hard disks (HDD), their types and parameters.

6. Solid-state drives (SSD), their types and parameters.
7. Flash memory, characteristics and specifications.
8. External PC interfaces.
9. Peripheral devices for input and output of information.
10. Main characteristics of monitors.

## ASSESSMENT CRITERIA OF KNOWLEDGE OF ENTRANTS

### General evaluation criteria

The level of professional competence of entrants is assessed on a 200-point scale.

The following levels of competence are distinguished:

**I level - initial.** The entrant's answers to theoretical questions are elementary, fragmentary, conditioned by initial ideas about modern information technologies of educational and professional direction and the methodology of teaching computer disciplines . In the answers to practical tasks, the student does not show independence, does not demonstrate the ability to analyze cause-and-effect relationships between data processing processes and the characteristics of relevant computer technologies. The entrant does not have knowledge and skills about software products and programming environments.

**II level - medium .** The entrant possesses a certain set of theoretical knowledge, practical skills, skills in modern information technologies of educational and professional direction and methods of teaching computer disciplines , is able to perform tasks according to the model, has elementary skills to carry out search, heuristic activities, independently acquire new knowledge. The entrant has basic concepts of the programming language.

**Level III is sufficient .** The entrant orients himself in issues of modern information technologies of educational and professional direction and methods of teaching computer disciplines , as well as independently applies knowledge in standard situations, possesses mental operations (analysis, abstraction, generalization, etc.), knows how to draw conclusions, correct mistakes made during implementation practical tasks, writing computer programs. The answer is complete, correct, logical, well-founded, although it lacks its own judgments.

**IV level - high .** Presupposes in-depth knowledge of modern educational and professional information technologies and methods of professional teaching of computer disciplines; the ability to apply knowledge creatively, provide feedback in one's work, independently evaluate various situations, phenomena, facts, identify and defend a personal position regarding the selection and use of appropriate software for the implementation and demonstration of examples of practical application of knowledge and skills of software material. The entrant's answer demonstrates his ability to freely use various types of software, describe basic algorithms and explain the specifics of their operation.

**Correspondence table**  
**levels of preparation by the value of the 200-point scale for evaluating the answers of**  
**entrants**  
**during the entrance test**

Level of competence	Rating scale	National rating scale
<p><b>Initial</b>  The entrant's answers are incorrect, fragmentary, testifying to a lack of understanding of the program material as a whole.</p>	0-99	unsatisfactorily
<p><b>Average</b>  The student's answers are determined by the correct understanding of certain aspects of the program material, but they are characterized by superficiality and fragmentation, and certain inaccuracies in terminology and definitions are allowed. Tasks of a practical nature are not solved or gross algorithmic and computational errors were made in their solution.</p>	100-149	satisfactorily
<p><b>Sufficient</b>  The entrant's answers determine a correct and deep understanding of the essence of the questions of the program material, but at the same time certain inaccuracies of a non-principled nature are allowed. In tasks of a practical nature, the implementation of algorithms is suboptimal. Computer programs may contain individual unproductive commands that do not distort the final result.</p>	150-179	fine
<p><b>High</b>  The entrant's answers are determined by a correct and deep understanding of the essence of the questions of the program material. Implementation of the algorithms of the assigned tasks is optimal, and computer programs are not overloaded with unnecessary unproductive commands.</p>	180-200	perfectly

## LIST OF RECOMMENDED LITERATURE

1. Avramenko V. S. Fundamentals of operating systems. Tutorial. / V.S. Avramenko, A. S. Avramenko // Cherkasy: Bohdan Khmelnytsky National University, 2018. – 524 p. ISBN 966-552-157-8
2. Algorithmization and programming / author . Yu. S. Protsyk , T. S. Samotiy, M. V. Levkovich, Department of IT of NLTU of Ukraine // Lviv: NLTU of Ukraine, 2017. [Electronic resource]: <http://vee.nltu.edu.ua/course/view.php?id=3>
3. Algorithmization and programming: Workshop / L. I. Kubliy // Kyiv: KPI named after Igor Sikorskyi, 2019. – 209 p.
4. Basic concepts and terms of web technologies / A. V. Kilchenko , O. I. Popovskiy , O. V. Tebenko , O. V. Tebenko , N. M. Matrosova; Compiler: A. V. K. Kilchenko : IITZN National Academy of Sciences of Ukraine, 2014. 49 p.
5. Bandorina L.M. Basics of algorithmization and programming: teaching . manual. / L.M. Bandorina , T.O. Klymkovich , K.O. Udachyna // UDUNT, 2022. 158 p.
6. Borodkina I.L., Borodkin G.O. Web technologies and Web design: application of the HTML language to create electronic resources. K.: Lira, 2020. 212 p.
7. Burov E.V. Computer networks: a textbook. Lviv: Magnolia, 2010. 262 p.
8. Voytovych I. S., Malezhik M. P., Sergienko V. P. Architecture of information systems: education . help for studies higher teach app . Rivne: O. Zen, 2011. 322 p.
9. Gladush V. A., Lysenko G. I. Higher school pedagogy: theory, practice, history. Study help Dnipropetrovsk, 2014. 416 p.
10. Hnedko N. M., Voytovych I. S. The method of using virtual visual aids in the educational process: educational and methodological manual. Rivne: O. Zen, 2014. 308 p.
11. State standard of basic and full secondary education. URL: <https://zakon.rada.gov.ua/laws/show/1392-2011-%D0%BF#Text> Distance and mixed education at school. Guide / Arrange . Vorotnikova I.P. Kyiv: Kyiv. University named after B. Hrinchenko. 2020. 48 p.
12. Dybkova L.M. Informatics and computer technology: education . help K.: Akademydav . 2012, 463 p.
13. Google applications in the teacher's professional activity. URL: <http://surl.li/mpwmo>
14. Eric Freeman , Elizabeth Robson . Head book First . JavaScript programming . Plot. 2022. 672 p.
15. Zhurakovsky B.Yu. Computer networks. Part 1. Study guide / B.Yu. Zhurakovskiy , I.O. Zeniv – K.: KPI named after I. Sikorskyi, 2020. – 336 p.
16. Zadereyko O.V. Operating systems: study guide / O.V. Zadereyko , S.L. Zinovatna , A.A. Toloknov . // Odesa: Phoenix, 2022. – 140 p. [Electronic resource] Access mode: <https://hdl.handle.net/11300/22701>.
17. Zaitsev, V.G. Operating systems: study guide for students of specialty 123 "Computer engineering" / V.G. Zaitsev, I.P. A little bit . // Kyiv: KPI named after Igor Sikorskyi, 2019. – 240 p.
18. Informatics and modern information technologies with teaching methods: educational and methodological manual / A. A. Timchenko. Mykolaiv: SPD Rumyantseva, 2018. 239 p.
19. Matvienko M.P., Shapovalov S.P. Mathematical logic and theory of algorithms: teaching . help Kyiv: Lira-K Publishing House, 2017. 212 p.
20. Mathematical logic and theory of algorithms: workshop / editor: P. F. Zhuk - K.: NAU, 2014. - 21 p.
21. Matvienko O.V. , Borodkina I. L. Internet technologies: designing Web pages: Education . Guide . for university students. 2nd ed., revision. and additional K.: TsNL. 2017. 154c.
22. Methodology of teaching informatics: Instructional and methodological manual for the course "Methodology of teaching informatics in high school" Part 1 / compiled by L. M. Parshukova . Uman: FOP Zhovtyy O. O., 2014. 132 p.

23. Morse N.V. Methodology of teaching informatics: Part II. Methodology of teaching information technologies: teaching . help Kyiv: Study . book, 2003. 288 p.
24. Morse N.V. Methodology of teaching informatics: Part III. Methodology for teaching the basic services of the global Internet network: teach . help Kyiv: Study . book, 2003. 200 p.
25. Morse N.V. Methodology of teaching informatics: Part IV. Methods of learning the basics of algorithmization and programming: teaching . help Kyiv: Study . book, 2004. 368 p.
26. Pasichnyk V.V., Pasichnyk O.V., Uhryn D.I. Web technologies. Lviv: "Magnolia 2006", 2018. 336 p.
27. Ryshkovets Yu. V. Algorithmization and programming. Part 1: study guide. / Yu. V. Ryshkovets , V. A. Vysotska // Lviv: "New World-200" Publishing House, 2021. 337 p.
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29. Rechyh N.V. Informatics: web technologies (optional module for grades 10-11, standard level) / N.V. The thing Kharkiv: Ranok Publishing House, 2020. 164 p.
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