Ministry of Education and Science of Ukraine
Dnipro University of Technology

Department of Information Technology and Computer Engineering

"APPROVED"
Head of Department
Hnatushenko V.V. _____
«30» June 2022 year

WORK PROGRAM OF THE ACADEMIC DISCIPLINE
"Computer science"

Field of study…….……....	14 Electrical engineering
Specialty.....	141 Electric Power Engineering, Electrical Engineering and Electromechanics
Academic degree.....	First (bachelor)
Academic program.....	Electric Power Engineering, Electrical Engineering and Electromechanics
Type of discipline.....	compulsory
Total workload……..	5 credits ECTS (150 hours)
Type of final assessment.....	graded test (1 semester) exam (2 semester)
Period of study.....	1 semester, 1st and 2nd quarters 2 semester, 3 quarter
Language of study.....	English

Lecturers: Associate Professor Kashtan V.Yu.

Prolonged: for 20 __ / 20__ academic year _____ (_____) "__" ___ 20__.
(Signature, name, date)

for 20 __ / 20__ academic year _____ (_____) "__" ___ 20__.
(Signature, name, date)

Dnipro
Dnipro University of Technology
2022

Work program of the academic discipline **"Computer science"** for bachelor's specialty 141 Electric Power Engineering, Electrical Engineering and Electromechanics. Dnipro University of Technology Department of Information Technology and Computer Engineering. - D: Dnipro University of Technology 2022. - 16 p.

Authors – Kashtan V.Yu., Associate Professor at the department of Information Technology and Computer Engineering

The work program regulates:

– key goals and objectives;
– the disciplinary learning outcomes generated through the transformation of the intended learning outcomes of the degree program;
– the content of the discipline formed according to the criterion "disciplinary learning outcomes";
– the discipline program (thematic plan by different types of classes);
– distribution of the discipline workload by different types of classes;
– an algorithm for assessing the level of achievement of disciplinary learning outcomes (scales, tools, procedures and evaluation criteria);
– criteria and procedures for evaluating the academic achievements of applicants by discipline;
– the contents of the educational and methodological support of the discipline;

The work program is designed to implement a competency approach in planning an education process, delivery of the academic discipline, preparing students for control activities, controlling the implementation of educational activities, internal and external quality assurance in higher education, accreditation of degree programs within the specialty.

Approved by the decision of the Scientific-Methodical Commission of specialty 141 «Electric Power Engineering, Electrical Engineering and Electromechanics» at the request of the Department of Higher Mathematics (protocol № 21/22-06 dated 16.06.22).

CONTENTS

1 DISCIPLINE OBJECTIVES

In the educational and professional programs of the Dnipro University of Technology specialty 141 Electric Power Engineering, Electrical Engineering and Electromechanics, the distribution of program learning outcomes (NRN) for the organizational forms of the educational process is done. In particular, the following learning outcomes are attributed to the discipline Б3 "**Computer science**":

ПР06	Apply application software, microcontrollers and microprocessor technology to solve practical problems in professional activities.
ПР18	Be able to learn independently, acquire new knowledge and improve skills in working with modern equipment, measuring equipment and application software.

The objective of discipline – formation of competencies regarding the use of computer hardware and software, operating systems, and programming elements to solve the problems of increasing the efficiency of the use of electric power, electrotechnical, and electromechanical equipment.

The implementation of the objective requires transforming program learning outcomes into disciplinary ones as well as an adequate selection of the contents of the discipline according to this criterion.

2 INTENDED DISCIPLINARY LEARNING OUTCOMES

Code NRN	**Disciplinary learning outcomes (DRN)**	
	DRN code	**content**
ПР06	ПР06.1-Б3	To know the basics and principles of computer architecture, history of its development, number systems, units of measurement and presentation of data in computer memory.
	ПР06.2-Б3	To have hardware and software integration of functioning elements of computing equipment.
	ПР06.3-Б3	To have the principles of algorithmization and software development.
	ПР06.4-Б3	Be able to implement calculations when developing console programs and programs with a graphical user interface.
	ПР06.5-Б3	To have skills in using operators, operands, variables, and data of various types.
	ПР06.6-Б3	To have skills in using branched operators, loops, and array formation.
ПР18	ПР18.1-Б3	To have skills in working with computer system interfaces, data coding in computers, and modern information technologies.
	ПР18.2-Б3	Be able to install and configure components to build, repair or upgrade personal computers.
	ПР18.3-Б3	Be able to classify and use system and application software in practice.

3 BASIC DISCIPLINES

The discipline is taught in the first semester of the first year by the curriculum, so no additional requirements for basic disciplines are established. Interdisciplinary connections: the study of the course based on the learning outcomes obtained during the study of the educational program of the previous level of education.

4 WORKLOAD DISTRIBUTION BY THE FORM OF EDUCATIONAL PROCESS ORGANIZATION AND TYPES OF CLASSES

Type of classes	**Workload** hours	**Distribution by forms of education**, *hours*					
		Full-time		**Part-time**		**Distance**	
		Classes (C)	Individual work (IW)	Classes (C)	Individual work (IW)	Classes (C)	Individual work (IW)
1 semester							
lecture	43	26	17	-	-	-	-
laboratory	33	21	12	-	-	-	-
practical	21	11	10				
TOGETHER in the 1st semester	97	58	39	-	-	-	-
2 semester							
lecture	29	12	17	-	-	-	-
laboratory	24	9	15	-	-	-	-
TOGETHER in the 2d semester	53	21	32	-	-	-	-
TOGETHER (1st and 2d semesters)	**150**	**79**	**71**	-	-	-	-

5 DISCIPLINE PROGRAM BY TYPES OF CLASSES

Ciphers ДРН	**Types and topics of training sessions**	**Hours**
	1 semester	
	LECTURES	**43**
ПР06.1-Б3	**1. Introduction to computer engineering and programming**	4
	Information, its types and properties.	
	The concept of personal computers, their role in computer science.	
	Classification of computer architectures. Von Neumann's architecture	
	The main areas of application of computer technology in the field of electrical engineering.	
	Significance and main directions of application of computer technology in the field of electrical engineering.	
ПР06.1-Б3 ПР18.3-Б3	**2. Personal Computer Hardware**	10
	Case and power supplies	
	Electricity: Ohm's law. Voltage fluctuations in electrical networks.	
	Motherboard Components	

Ciphers ДРН	Types and topics of training sessions	Hours
	CPUs and Cooling Systems	
	Types of Memory	
	Adapter Cards and Expansion Slots	
	Hard disk drives and SSDs	
	Optical Storage Devices	
	Personal computer input, output devices.	
	Characteristics of the main parts of the laptop	
	Electrical Power	
	Arithmetic basics of a personal computer	
	Logical basics of a personal computer	
	Configurations for Specialized Computers	
ПР06.1-Б3 ПР06.2-Б3 ПР18.2-Б3	**3. Computer Assembly and Disassembly**	4
	General and Fire Safety	
	Install the Motherboard Components	
	Install the RAM	
	Ports, Connectors, and Cables	
	Identify the tools and software used with personal computer components and their purpose.	
	Steps of installation work	
	Boot the computer after it is assembled	
	Computer configuration of the system components	
ПР06.1-Б3 ПР06.2-Б3 ПР18.3-Б3	**4. Preventive Maintenance and Troubleshooting**	4
	Personal computer preventive maintenance overview	
	Apply Troubleshooting Process to Computer Components and Peripherals	
	Setting a computer system in BIOS Setup	
	Interaction of the automatic control system with the automatic diagnostic system. POST.	
ПР06.2-Б3 ПР06.3-Б3	**5. Basic concepts of computer programming**	6
	Features of programming technology	
	Object-oriented programming	
	Types and composition of programming systems	
	A generation of programming languages.	
	Programming systems.	
	Data Representation in computers. Representing Numbers.	
ПР06.3-Б3	**6. Algorithmization of computational processes**	8
	The concept of algorithm and its main properties.	
	Basic concepts of algorithmization of computational processes.	
	Variants to set algorithms.	

Ciphers ДРН	Types and topics of training sessions	Hours
	Structures of algorithms.	
	Schemes of algorithms.	
	Examples of ways to solve algorithm structures.	
	Examples of solving problems for compiling algorithms.	
ПР06.3-Б3 ПР06.4-Б3 ПР06.5-Б3	**7. The VBA development environment and its syntax**	7
	The object structure of the VBA language. Main characteristics of components, syntax.	
	Basic principles of creating programs in the VBA language.	
	Object-oriented programming in VBA.	
	Custom classes. Creating object variables.	
	Development of the program interface. Components: Form, properties, and methods of the UserForm object; Button, Label, Text Box, and Image.	
LABORATORY WORKS		**33**
ПР06.1-Б3	1. Basic components of a personal computer in HWINFO64	5
ПР06.1-Б3 ПР06.2-Б3	2. Components on the motherboard.	5
ПР18.2-Б3	3. Build a Specialized Computer System.	3
ПР06.1-Б3 ПР06.2-Б3 ПР18.3-Б3	4. Diagnostic Software.	3
ПР06.1-Б3 ПР06.2-Б3 ПР18.3-Б3	5. Post test. BIOS Setup Utility and Common Trouble Shooting	4
ПР18.1-Б3	6. A block diagram of algorithms in the MS Office 365 environment.	5
ПР06.3-Б3 ПР06.3-Б3	7. Execute simple data structure programs and their implementation in the form of projects in the VBA environment. Work with data input and output.	4
ПР18.1-Б3 ПР06.4-Б3	8. Familiarity with components: Form, Button, Label, Text Box, and Image. Compiling programs using these components.	4
PRACTICAL WORKS		**21**
ПР06.1-Б3 ПР06.2-Б3 ПР18.2-Б3 ПР18.3-Б3	1. Electricity and Ohms Laws.	3
	2. Complete the Computer Assembly.	3
	3. Disassemble a Computer.	3
	4. Assembly and disassemble the Laptop	3
	5. Numbering systems	4
	6. Arithmetic operations in positional number system	5
	TOTAL	**97**

Ciphers ДРН	Types and topics of training sessions	Hours
	2 semester	
	LECTURES	**29**
ПР06.3-Б3 ПР06.5-Б3	**1. Introduction to the C ++ programming language**	6
	General characteristics of language	
	Software development technology	
	Alphabet and identifiers	
	Operations, expressions and operators	
	Classification of data types	
	Values in C++	
	The task of constants	
	Existence time and scope of variables	
ПР06.4-Б3 ПР06.6-Б3 ПР18.1-Б3	**2. Branch programming**	8
	Development of structured programs	
	Conditional instructions: ***if, else, switch***	
	Examples of using the if and switch case operators	
	Conditional instructions: ***if then else end if; select case***	
ПР06.4-Б3 ПР06.6-Б3 ПР18.1-Б3	**3. Loops programming**	9
	The '***while'*** loop	
	The '***do ... while'*** loop	
	The ***for*** statement	
	Operators: ***for... next; do...loop; while...wend***	
	Examples of using loop operators.	
	Nested loops	
	Recommendations for choosing loops	
	Control operators in loops	
	Examples of using loops	
ПР06.3-Б7 ПР06.6-Б3	**4. Arrays**	6
	Declaring and initializing arrays	
	One-dimensional and two-dimensional arrays	
	Examples of using arrays	
	LABORATORY WORKS	**24**
ПР06.1-Б3 ПР18.5-Б3	1. Introduction to Microsoft Visual Visual C++. Types of projects. Creating a project in Microsoft Visual Studio	2
ПР06.3-Б3 ПР06.5-Б3	2. Working with Data Types. Arithmetic and logic operations. Development of algorithms and construction of block diagrams.	2
ПР06.3-Б3 ПР18.1-Б3	3. Linear programming is based on the C++ language.	3
ПР06.3-Б3 ПР06.4-Б3 ПР06.6-Б3 ПР18.1-Б3	4. Branched programming is based on the C++ language.	5

Ciphers ДРН	Types and topics of training sessions	Hours
ПР06.3-Б3 ПР06.5-Б3 ПР06.6-Б3	5. Cyclic programming in the C++ language.	6
ПР06.3-Б3 ПР06.4-Б3 ПР18.1-Б3	6. Development of the user interface in the Visual Basic language based on branched, cyclical processes.	6
	TOTAL	**53**
	TOTAL (1st and 2d semesters))	**150**

6 KNOWLEDGE PROGRESS TESTING

Certification of student achievement is accomplished through transparent procedures based on objective criteria in accordance with the University Regulations "On Evaluation of Higher Education Applicants' Learning Outcomes".

The level of competencies achieved in relation to the expectations, identified during the control activities, reflects the real result of the student's study of the discipline.

6.1 GRADING SCALES

Assessment of academic achievement of students of the Dnipro University of Technology is carried out based on a rating (100-point) and institutional grading scales. The latter is necessary (in the official absence of a national scale) to convert (transfer) grades for mobile students.

The scales of assessment of learning outcomes of the NTUDP students

Rating	Institutional
90 ... 100	Excellent
74 ... 89	Good
60 ... 73	Satisfactory
0 ... 59	Failed

Discipline credits are scored if the student has a final grade of at least 60 points. A lower grade is considered to be an academic debt that is subject to liquidation in accordance with the Regulations on the Organization of the Educational Process of NTUDP.

6.2 DIAGNOSTIC TOOLS AND EVALUATION PROCEDURES

The content of diagnostic tools is aimed at controlling the level of knowledge, skills, communication, autonomy, and responsibility of the student according to the requirements of the National Qualifications Framework (NQF) up to the 7th qualification level during the demonstration of the learning outcomes regulated by the work program.

During the control activities, the student should perform tasks focused solely on the demonstration of disciplinary learning outcomes (Section 2).

Diagnostic tools provided to students at the control activities in the form of tasks for the intermediate and final knowledge progress testing are formed by specifying the initial data and a way of demonstrating disciplinary learning outcomes.

Diagnostic tools (control tasks) for the intermediate and final knowledge progress testing are approved by the appropriate department.

Type of diagnostic tools and procedures for evaluating the intermediate and final knowledge progress testing are given below.

Diagnostic and assessment procedures

<table>
<tr><th colspan="3">INTERMEDIATE CONTROL</th><th colspan="2">FINAL ASSESSMENT</th></tr>
<tr><th>training sessions</th><th>diagnostic tools</th><th>procedures</th><th>diagnostic tools</th><th>procedures</th></tr>
<tr><td>lectures</td><td>control tasks for each topic</td><td>task during lectures</td><td rowspan="4">comprehensive reference work (CCW)</td><td rowspan="4">determining the average results of intermediate controls;

CCW performance during the examination at the request of the student</td></tr>
<tr><td rowspan="2">practical</td><td>control tasks for each topic</td><td>tasks during practical classes</td></tr>
<tr><td>or individual task</td><td>tasks during independent work</td></tr>
<tr><td>Laboratory</td><td>control tasks for each topic or individual task</td><td>performing tasks during independent work</td></tr>
</table>

During the intermediate control, the lectures are evaluated by determining the quality of the performance of the control specific tasks. Practical classes are assessed by the quality of the control or individual task.

If the content of a particular type of teaching activity is subordinated to several descriptors, then the integral value of the assessment may be determined by the weighting coefficients set by the lecturer.

Provided that the level of results of the intermediate controls of all types of training at least 60 points, the final control can be carried out without the student's immediate participation by determining the weighted average value of the obtained grades.

Regardless of the results of the intermediate control, every student during the final knowledge progress testing has the right to perform the CDF, which contains tasks covering key disciplinary learning outcomes.

The number of specific tasks of the CDF should be consistent with the allotted time for completion. The number of CDF options should ensure that the task is individualized.

The value of the mark for the implementation of the CDF is determined by the average evaluation of the components (specific tasks) and is final.

The integral value of the CDF performance assessment can be determined by taking into account the weighting factors established by the department for each NLC descriptor.

6.3 EVALUATION CRITERIA

The actual student learning outcomes are identified and measured against what is expected during the control activities using criteria that describe the student's actions to demonstrate the achievement of the learning outcomes.

To evaluate the performance of the control tasks during the intermediate control of lectures and practicals the assimilation factor is used as a criterion, which automatically adapts the indicator to the rating scale:

$$O_i = 100\ a / m,$$

where a - number of correct answers or significant operations performed according to the solution standard; m - the total number of questions or substantial operations of the standard.

Individual tasks and complex control works are expertly evaluated using criteria that characterize the ratio of competency requirements and evaluation indicators to a rating scale.

The content of the criteria is based on the competencies identified by the NLC for the Bachelor's level of higher education (given below).

Integral competence is the ability to solve complex problems and specialized practical problems in a particular area of professional activities or in a learning process that involves the use of certain theories and methods of the relevant scientific areas and characterized by complexity and conditions uncertainty.

General criteria for achieving learning outcomes for the 6th qualification level according to the NLC

descriptors NLC	**Requirements for knowledge, communication, autonomy and responsibility**	**Indicator evaluation**
Knowledge		
♦ Conceptual knowledge acquired during the training and professional activities, including some knowledge of modern achievements; ♦ critical understanding of the main theories, principles, methods, and concepts in education and careers	- A great - proper, reasonable, sensible. Measures the presence of: - conceptual knowledge; - a high degree of state ownership issues; - critical understanding of the main theories, principles, methods and concepts in education and careers	95-100
	A non-gross contains mistakes or errors	90-94
	The answer is correct but has some inaccuracies	85-89
	A correct some inaccuracies but has also proved insufficient	80-84
	The answer is correct but has some inaccuracies, not reasonable and meaningful	74-79
	A fragmentary	70-73
	A student shows a fuzzy idea of the object of study	65-69
	Knowledge minimally satisfactory	60-64
	Knowledge unsatisfactory	<60

descriptors NLC	Requirements for knowledge, communication, autonomy and responsibility	Indicator evaluation
Ability		
♦ solving complex problems and unforeseen problems in specialized areas of professional and/or training, which involves the collection and interpretation of information (data), choice of methods and tools, the use of innovative approaches	- The answer describes the ability to: - identify the problem; - formulate hypotheses; - solve problems; - choose adequate methods and tools; - collect and interpret logical and understandable information; - use innovative approaches to solving the problem	95-100
	The answer describes the ability to apply knowledge in practice with no blunders	90-94
	The answer describes the ability to apply knowledge in practice but has some errors in the implementation of a requirement	85-89
	The answer describes the ability to apply knowledge in practice but has some errors in the implementation of the two requirements	80-84
	The answer describes the ability to apply knowledge in practice but has some errors in the implementation of the three requirements	74-79
	The answer describes the ability to apply knowledge in practice but has some errors in the implementation of the four requirements	70-73
	The answer describes the ability to apply knowledge in practice while performing tasks on the model	65-69
	A characterizes the ability to apply knowledge in performing tasks on the model, but with uncertainties	60-64
	The level of skills is poor	<60
Communication		
♦ report to specialists and non-specialists of information, ideas, problems, solutions and their experience in the field of professional activity; ♦ the ability to form an effective communication strategy	- Fluent problematic area. Clarity response (report). Language - correct; - - net; - - clear; - - accurate; - - logic; - - expressive; - - concise. Communication strategy: coherent and consistent development of thought; availability of own logical reasoning; relevant arguments and its compliance with the provisions defended; the correct structure of the response (report); correct answers to questions; appropriate equipment to answer questions; the ability to draw conclusions and formulate proposals	95-100
	Adequate ownership industry issues with minor faults. Sufficient clarity response (report) with minor faults. Appropriate communication strategy with minor faults	90-94

descriptors NLC	Requirements for knowledge, communication, autonomy and responsibility	Indicator evaluation
	Good knowledge of the problems of the industry. Good clarity response (report) and relevant communication strategy (total three requirements are not implemented)	85-89
	Good knowledge of the problems of the industry. Good clarity response (report) and relevant communication strategy (a total of four requirements is not implemented)	80-84
	Good knowledge of the problems of the industry. Good clarity response (report) and relevant communication strategy (total not implemented the five requirements)	74-79
	Satisfactory ownership issues of the industry. Satisfactory clarity response (report) and relevant communication strategy (a total of seven requirements not implemented)	70-73
	Partial ownership issues of the industry. Satisfactory clarity response (report) and communication strategy of faults (total not implemented nine requirements)	65-69
	The fragmented ownership issues of the industry. Satisfactory clarity response (report) and communication strategy of faults (total not implemented 10 requirements)	60-64
	The level of poor communication	<60
Autonomy and responsibility		
♦ management actions or complex projects, responsible for decision-making in unpredictable conditions; ♦ responsible for the professional development of individuals and/or groups ♦ the ability to continue study with a high degree of autonomy	- Excellent individual ownership management competencies focused on: 1) management of complex projects, providing: - exploratory learning activities marked the ability to independently evaluate various life situations, events, facts, detect and defend a personal position; - the ability to work in a team; - control of their own actions; 2) responsibility for decision-making in unpredictable conditions, including: - justify their decisions the provisions of the regulatory framework of sectoral and national levels; - independence while performing tasks; - lead in discussing problems; - responsibility for the relationship; 3) responsible for the professional development of individuals and/or groups that includes: - use of vocational-oriented skills; - the use of evidence from independent and correct reasoning; - possession of all kinds of learning activities; 4) the ability to further study with a high degree of autonomy, which provides: - degree possession of fundamental knowledge; - independent evaluation judgments; - high level of formation of general educational skills; - search and analysis of information resources	95-100
	Confident personality possession competency management (not implemented two requirements)	90-94
	Good knowledge management competencies personality	85-89

descriptors NLC	Requirements for knowledge, communication, autonomy and responsibility	Indicator evaluation
	(not implemented three requirements)	
	Good knowledge management competencies personality (not implemented the four requirements)	80-84
	Good knowledge management competencies personality (not implemented six requirements)	74-79
	Satisfactory ownership of individual competence management (not implemented seven requirements)	70-73
	Satisfactory ownership of individual competence management (not implemented eight claims)	65-69
	The level of autonomy and responsibility fragmented	60-64
	The level of autonomy and responsibility poor	<60

7 TOOLS, EQUIPMENT, AND SOFTWARE

The laboratory and instrumental base of the graduating department of information technologies and computer engineering:

- HWINFO64;
- MS Visual Studio Community 2019;
- MS Visual Basic;
- LibreOffice 6.4;
- Windows 10;
- MS Office 365;
- Virtual Desktop;
- Virtual Laptop;
- computer and multimedia equipment are used;
- distance learning platform Moodle, MS Teams.

.

8 RECOMMENDED BIBLIOGRAPHY

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