Ministry of Education and Science of Ukraine
Dnipro University of Technology

Department of Information Technologies and Computer Engineering

"APPROVED"
Head of Department

Hnatushenko V.V. _____

«30» August 2022

WORK PROGRAM OF THE ACADEMIC DISCIPLINE

"Computing and programming"

Field of study......................................	14 Electrical engineering
Specialty	141 Electrical energetics, electrical engineering and electromechanics
Academic level...................................	first (bachelor)
Academic program	«Electrical energetics, electrical engineering and electromechanics»
Specialization	-
Status	normative
Total workload	5 credits ECTS (150 hours)
Type of final assessment	exam
Period of study	1, 2 semesters (1-3 terms)
Language of study	English

Lecturer: Assoc. Prof. Kashtan V.Yu.

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

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

Dnipro
DNIPROTECH
2022

Work program of the academic discipline «Computing and programming» for bachelor**s** of the educational and professional program «Electrical energetics, electrical engineering and electromechanics» of the specialty 141 Electrical energetics, electrical engineering and electromechanics / Dnipro University of Technology, Department of Information Technologies and Computer Engineering. - D: DNIPROTECH, 2022. – 16 p.

Author:

– Kashtan Vita Yuriivna – Associate Professor, Candidate of Technical Sciences, Associate Professor at the Department of Information Technologies and Computer Engineering.

The work program regulates:
– the aim of the discipline;
– the disciplinary learning outcomes generated through the transformation of the intended learning outcomes of the degree program;
– basic disciplines;
– volume and distribution by forms of organization of the educational process and types of classes;
– discipline program (thematic plan by type of training);
– algorithm for assessing the level of achievement of disciplinary learning outcomes (scales, tools, procedures and assessment criteria);
– tools, equipment and software;
– recommended sources of information.

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 and Methodological Commission of the specialty 141 Electrical energetics, electrical engineering and electromechanics (protocol №21/22-07 of 14.07.2022).

CONTENTS

1 AIM OF THE DISCIPLINE

In the educational and professional program «Electrical energetics, electrical engineering and electromechanics» of the specialty 141 Electrical energetics, electrical engineering and electromechanics the distribution of program learning outcomes (PLO) for the organizational forms of the educational process is done. In particular, the following learning outcomes are attributed to the discipline Б3 «Computing and programming»:

| PLO06 | To apply application software, microcontrollers and microprocessor technology to solve practical problems in professional activities. |
| PLO18 | To be able to learn independently, acquire new knowledge and improve skills in working with modern equipment, measuring equipment and application software. |

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

2 INTENDED DISCIPLINARY LEARNING OUTCOMES

PLO	Disciplinary learning outcomes (DLO)	
	Code DLO	content
PLO06	PLO06.1-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.
	PLO06.2-Б3	To have hardware and software integration of functioning elements of computing equipment.
	PLO06.3-Б3	To have the principles of algorithmization and software development.
	PLO06.4-Б3	To be able to implement calculations when developing console programs and programs with a graphical user interface.
	PLO06.5-Б3	To have skills in using operators, operands, variables, and data of various types.
	PLO06.6-Б3	To have skills in using branched operators, loops, and array formation.
PLO18	PLO18.1-Б3	To have skills in working with computer system interfaces, data coding in computers, and modern information technologies.
	PLO18.2-Б3	To be able to install and configure components to build, repair or upgrade personal computers.
	PLO18.3-Б3	To 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		Extramural	
		Classes (C)	Individual work (IW)	Classes (C)	Individual work (IW)	Classes (C)	Individual work (IW)
1 semester							
lecture	45	26	19	-	-	4	44
laboratory	30	26	4	-	-	4	43
practical	20	13	7	-	-	-	-
TOGETHER in the 1st semester	95	65	30	-	-	8	87
2 semester							
lecture	30	18	12	-	-	4	27
laboratory	25	9	16	-	-	2	22
TOGETHER in the 2d semester	55	27	28	-	-	6	49
TOGETHER	**150**	**92**	**58**	**-**	**-**	**14**	**136**

5 DISCIPLINE PROGRAM BY TYPES OF TEACHING ACTIVITIES

Code DLO	Types and topics of teaching activities	Volume of components, *hours*
	1 semester	
	LECTURES	**45**
PLO06.1-Б3	**1. Introduction to computer engineering and programming**	4
	Information, its types and properties.	
	The concept of personal computers, their role in Computing and programming.	
	Classification of computer architectures. Von Neumann's architecture	
	Significance and main directions of application of computer technology in the field of electrical engineering.	
PLO06.1-Б3 PLO18.3-Б3	**2. Personal Computer Hardware**	10
	Case and power supplies	
	Electricity: Ohm's law. Voltage fluctuations in electrical networks.	
	Motherboard Components	
	CPUs and Cooling Systems	

Code DLO	Types and topics of teaching activities	Volume of components, *hours*
	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	
PLO06.1-Б3 PLO06.2-Б3 PLO18.2-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	
PLO06.1-Б3 PLO06.2-Б3 PLO18.3-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.	
PLO06.2-Б3 PLO06.3-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.	
PLO06.3-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.	

Code DLO	Types and topics of teaching activities	Volume of components, *hours*
	Structures of algorithms.	
	Schemes of algorithms.	
	Examples of ways to solve algorithm structures.	
	Examples of solving problems for compiling algorithms.	
PLO06.3-Б3 PLO06.4-Б3 PLO06.5-Б3	**7. The VBA development environment and its syntax**	9
	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		**30**
PLO06.1-Б3	1. Basic components of a personal computer in HWINFO64	4
PLO06.1-Б3 PLO06.2-Б3	2. Components on the motherboard.	4
PLO18.2-Б3	3. Build a Specialized Computer System.	3
PLO06.1-Б3 PLO06.2-Б3 PLO18.3-Б3	4. Diagnostic Software.	3
PLO06.1-Б3 PLO06.2-Б3 PLO18.3-Б3	5. Post test. BIOS Setup Utility and Common Trouble Shooting	4
PLO18.1-Б3	6. A block diagram of algorithms in the MS Office 365 environment.	4
PLO06.3-Б3 PLO06.3-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
PLO18.1-Б3 PLO06.4-Б3	8. Familiarity with components: Form, Button, Label, Text Box, and Image. Compiling programs using these components.	4
PRACTICAL WORKS		**20**
PLO06.1-Б3 PLO06.2-Б3 PLO18.2-Б3 PLO18.3-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	4

Code DLO	Types and topics of teaching activities	Volume of components, *hours*
	TOTAL	**95**
	2 semester	
	LECTURES	**30**
PLO06.3-БЗ PLO06.5-БЗ	**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	
PLO06.4-БЗ PLO06.6-БЗ PLO18.1-БЗ	**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*	
PLO06.4-БЗ PLO06.6-БЗ PLO18.1-БЗ	**3. Loops programming**	10
	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	
PLO06.3-Б7 PLO06.6-БЗ	**4. Arrays**	6
	Declaring and initializing arrays	
	One-dimensional and two-dimensional arrays	
	Examples of using arrays	
	LABORATORY WORKS	**25**
PLO06.3-БЗ PLO6.4-БЗ	1. Introduction to Microsoft Visual Visual C++. Types of projects. Creating a project in Microsoft Visual Studio	2
PLO06.3-БЗ PLO06.5-БЗ	2. Working with Data Types. Arithmetic and logic operations. Development of algorithms and construction of block diagrams.	2
PLO06.3-БЗ PLO18.1-БЗ	3. Linear programming is based on the C++ language.	4

Code DLO	Types and topics of teaching activities	Volume of components, *hours*
PLO06.3-БЗ PLO06.4-БЗ PLO06.6-БЗ PLO18.1-БЗ	4. Branched programming is based on the C++ language.	5
PLO06.3-БЗ PLO06.5-БЗ PLO06.6-БЗ	5. Cyclic programming in the C++ language.	6
PLO06.3-БЗ PLO06.4-БЗ PLO18.1-БЗ	6. Development of the user interface in the Visual Basic language based on branched, cyclical processes.	6
	TOTAL	**55**
	TOTAL (1st and 2d semesters)	**150**

For the implementation of the mixed form of education of students, the electronic resources of the e-learning platform in the discipline are used: https://do.nmu.org.ua/course/view.php?id=3446

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 at 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 DNIPROTECH students

Rating	Institutional
90…100	відмінно / Excellent
74…89	добре / Good
60…73	задовільно / Satisfactory
0…59	незадовільно / Fail

Discipline credits are scored if the student has a final grade of at least 60 points. A lower grade is an academic debt that is subject to elimination under the Regulations on the Organization of the Educational Process in Dnipro University of Technology.

6.2 Tools and procedures

The content of diagnostic tools is aimed at controlling the level of knowledge, proficiency/skills, communication, autonomy, and responsibility of the student according to the requirements of the National Qualifications Framework (NQF) up to the 6th 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 formative and summative knowledge progress testing are formed by specifying the initial data and a way of demonstrating disciplinary learning outcomes.

Diagnostic tools (control tasks) for the formative and summative knowledge progress testing are approved by the department.
Type of diagnostic tools and procedures for evaluating the formative and summative knowledge progress testing are given below.

Diagnostic and assessment procedures

FORMATIVE ASSESSMENT			SUMMATIVE ASSESSMENT	
training activity	diagnostic tools	procedures	diagnostic tools	procedures
lectures	control tasks for each topic	performing the task during lectures	comprehensive reference work (CCW)	determining the average results of formative assessments; CCW performance during differentiated test in the 1st semester; during the exam in the 2nd semester at the request of the student
practice	inspection and defence	performing tasks during practical classes		
laboratory	inspection and defence	performing tasks during laboratorical classes		

During the formative assessment, the lectures are evaluated by determining the quality of the performance of the control specific tasks. Practical and laboratory classes are assessed by the quality of implementation and defence of laboratory and practical works.

If the content of a certain type of classes is subordinated to several components of the description of the qualification level according to the NQF, the integral value of the grade can be determined taking into account the weighting coefficients set by the lecturer.

Provided that the level of results of the formative assessments of all types of training at least 60 points, the summative assessment 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 formative assessments, every student during the differentiated test in the 1st semester and during exam in the 2nd semester has the right to perform the CCW, which contains tasks covering key disciplinary learning outcomes.

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

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

The integral value of the assessment of the implementation of the CCW can be determined taking into account the weighting coefficients established by the department for each component of the description of the qualification level of the NQF.

6.3 Criteria

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

To assess the performance of control tasks during the formative assessment on lectures, laboratory and practical classes the coefficient of mastery is used as a criterion, which automatically adapts the assessment indicator to the rating scale:

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

where a is a number of correct answers or significant operations performed in accordance with the solution standard; m is the total number of questions or significant operations of the standard.

Individual tasks and complex control works are assessed expertly using criteria that characterize the ratio of requirements to the level of competencies and indicators of assessment on a rating scale.

The content of the criteria is based on the competency characteristics defined by the NQF for the bachelor's level of higher education (given below).

General criteria for achieving learning outcomes
for the 6th qualification level of NQF (bachelor)

Description of qualification level	Requirements for knowledge, proficiency/skills, communication, autonomy and responsibility	Indicator evaluation
Knowleges		
Conceptual scientific and practical knowledge, critical understanding of theories, principles,	The answer is excellent - correct, reasonable, meaningful. Characterizes the presence of: - conceptual knowledge; - high degree of knowledge of the state of the art; - critical understanding of the basic theories, principles,	95-100

Description of qualification level	Requirements for knowledge, proficiency/skills, communication, autonomy and responsibility	Indicator evaluation
methods and concepts in the field of professional activity and / or training	methods and concepts in education and professional activity	
	The answer contains minor errors or omissions	90-94
	The answer is correct, but has some inaccuracies	85-89
	The answer is correct, but has some inaccuracies and is insufficiently substantiated	80-84
	The answer is correct, but has some inaccuracies, insufficiently substantiated and meaningful	74-79
	The answer is fragmentary	70-73
	The answer shows the student's vague ideas about the object of study	65-69
	The level of knowledge is minimally satisfactory	60-64
	The level of knowledge is unsatisfactory	<60
Proficiency/Skills		
In-depth cognitive and practical skills, mastery and innovation at the level required to solve complex specialized tasks and practical problems in the field of professional activity or training	The answer characterizes the ability to: - identify problems; - formulate hypotheses; - solve problems; - choose appropriate methods and tools; - collect and interpret information logically and clearly; - use innovative approaches to solving problems	95-100
	The answer characterizes the ability to apply knowledge in practice with minor errors	90-94
	The answer characterizes the ability to apply knowledge in practice, but has some inaccuracies in the implementation of one requirement	85-89
	The answer characterizes the ability to apply knowledge in practice, but has some inaccuracies in the implementation of the two requirements	80-84
	The answer characterizes the ability to apply knowledge in practice, but has some inaccuracies in the implementation of the three requirements	74-79
	The answer characterizes the ability to apply knowledge in practice, but has some inaccuracies in the implementation of the four requirements	70-73
	The answer characterizes the ability to apply knowledge in practice when performing tasks on the model	65-69
	The answer characterizes the ability to apply knowledge in performing tasks on the model, but with inaccuracies	60-64
	The level of skills is unsatisfactory	<60
Communication		
♦ reporting to specialists and non-specialists information, ideas, problems, solutions, own experience and argumentation	Fluency in industry issues. Clarity of the answer (report). Language: - correct; - clean; - clear; - accurate; - logical;	95-100

Description of qualification level	Requirements for knowledge, proficiency/skills, communication, autonomy and responsibility	Indicator evaluation
♦ data collection, interpretation and application ♦ communication on professional issues, including in a foreign language, orally and in writing	- expressive; - concise. Communication strategy: - consistent and consistent development of thought; - the presence of logical own judgments; - appropriate reasoning and its compliance with the defended provisions; - correct structure of the answer (report); - correct answers to questions; - appropriate technique for answering questions; - ability to draw conclusions and formulate proposals;	
	Sufficient knowledge of industry issues with minor flaws. Sufficient clarity of the answer (report) with minor flaws. Relevant communication strategy with minor flaws.	90-94
	Good knowledge of industry issues. Good clarity of the answer (report) and appropriate communication strategy (three requirements in total are not realized)	85-89
	Good knowledge of industry issues. Good clarity of the answer (report) and appropriate communication strategy (four requirements not implemented in total)	80-84
	Good knowledge of industry issues. Good clarity of the answer (report) and appropriate communication strategy (five requirements not implemented in total)	74-79
	Satisfactory knowledge of industry issues. Satisfactory clarity of the answer (report) and appropriate communication strategy (a total of seven requirements have not been implemented)	70-73
	Partial knowledge of industry issues. Satisfactory clarity of the answer (report) and communication strategy with errors (a total of nine requirements are not implemented)	65-69
	Partial knowledge of industry issues. Satisfactory clarity of the answer (report) and communication strategy with errors (a total of 10 requirements are not implemented)	60-64
	The level of communication is unsatisfactory	<60
Autonomy and responsibility		
♦ managing complex technical or professional activities or projects ♦ ability to take responsibility for making and making decisions in unpredictable work and / or learning	Excellent command of personal management competencies focused on: 1) management of complex projects, which involves: - research nature of educational activities, marked by the ability to independently assess various life situations, phenomena, facts, identify and defend a personal position; - ability to work in a team; - control of own actions; 2) responsibility for decision-making in unpredictable conditions, including:	95-100

Description of qualification level	Requirements for knowledge, proficiency/skills, communication, autonomy and responsibility	Indicator evaluation
contexts ♦ formation of judgments that take into account social, scientific and ethical aspects ♦ organization and management of professional development of individuals and groups ♦ ability to continue studies with a significant degree of autonomy	- justification of own decisions by the provisions of the regulatory framework of the industry and state levels; - independence in the performance of tasks; - initiative in discussing problems; - responsibility for relationships; 3) responsibility for the professional development of individuals and/or groups of individuals, which involves - use of professionally oriented skills; - use of evidence with independent and correct argumentation; - mastery of all types of learning activities; 4) the ability to continue learning with a high level of autonomy, which includes - the degree of mastery of fundamental knowledge; - independence of evaluative judgments; - a high level of general learning skills; - - independent search and analysis of information sources	
	Good mastery of personality management competencies (two requirements not met)	90-94
	Good mastery of personality management competencies (three requirements not met)	85-89
	Good mastery of personality management competencies (four requirements not met)	80-84
	Good mastery of personality management competencies (six requirements not met)	74-79
	Satisfactory mastery of personality management competencies (seven requirements not met)	70-73
	Satisfactory mastery of personality management competencies (eight requirements not met)	65-69
	The level of responsibility and autonomy is fragmentary	60-64
	The level of autonomy and responsibility is unsatisfactory	<60

7 TOOLS, EQUIPMENT AND SOFTWARE

The laboratory and instrumentation facilities of the Department of Information Technology and Computer Engineering, as well as computer and multimedia equipment, are used. Remote platforms Moodle, MS Teams.

8 RECOMMENDED SOURCES OF INFORMATION

1 semester

1. Kashtan V.Yu. Methodological instructions for the implementation of laboratory works in the discipline "Computer Engineering and Programming" for students of specialty 141 "Power engineering, electrical engineering and electromechanics" [Electronic resource], Part1. – 2021. URL: https://it.nmu.org.ua/ua/scientific_method_materials/teaching_materials.php.

2. Каштан В.Ю. Обчислювальна техніка та програмування для студентів спеціальності 141 " Електроенергетика, електротехніка та електромеханіка", 2022 Moodle. URL: https://do.nmu.org.ua/course/view.php?id=5304

3. Іванов В.Г. Основи інформатики та обчислювальної техніки: підручник / В. Г. Іванов, В. В. Карасюк, М. В. Гвозденко; за заг. ред. В. Г. Іванова. — Х.: Право, 2015. — 312 с.

4. Sarah L. Harris, David Harris. Digital Design and Computer Architecture: ARM Edition 1st Edition. – Morgan Kaufmann. – 2015. – 584p.

5. Sommerville I. Software Engineering, 10th ed. — Addison-Wesley / Pearson Education Limited, 2015. — 816 p.

6. Воробйова О.М. Електроніка та мікросхемотехніка: підручник / О.М. Воробйова, І.П. Панфілов, М.П. Савицька, Ю.В. Флейта. – Одеса: ОНАЗ ім. О.С. Попова, 2015. – 298 с.

7. Albert Paul Malvino. Digital computer electronics. – New Delhi : Tata Mcgraw Hill Education Pvt. Ltd. – 2011. – 522 p.

8. James Lance. The Beginner's Guide to Engineering: Computer Engineering. - CreateSpace Independent Publishing Platform. – 2013. – 158p. ISBN-10 : 1492981540.

9. Cisco Academy IT Essentials Interactive Tutorial: https://netacad.com.

2 semester

1. Булгакова О. С. Алгоритмізація і програмування: теорія та практика : навчальний посібник для дистанційного навчання / О. С. Булгакова, В. В. Зосімов, Г. В. Ходякова. – Миколаїв: СПД Румянцева, 2021. – 138 с.

2. Трофименко О.Г. С++. Алгоритмізація та програмування : підручник / О.Г. Трофименко, Ю.В. Прокоп, Н.І. Логінова, О.В. Задерейко. 2-ге вид. перероб. і доповн. Одеса : Фенікс, 2019. 477 с.

3. Roger Mayne. Introduction To Windows And Graphics Programming With Visual C++ (With Companion Media Pack), 2nd Edition. – World Scientific, 2015. – 480 p. ISBN-10: 9814699403, ISBN-13: 978-9814699402.

4. Harvey M. Deitel, Paul J. Deitel. C++ How no Program / 10th Edition. Pearson Education: 2017. 1074 p.

5. .Вступ до програмування мовою С++. Організація обчислень: навч. посіб. / Ю. А. Бєлов, Т. О. Карнаух, Ю. В. Коваль, А. Б. Ставровський. – К.: Видавничополіграфічний центр "Київський університет", 2012. – 175 с.

9 INFORMATION RESOURCES

Repository of the Dnipro University of Technology: http://ir.nmu.org.ua/

WORK PROGRAM OF THE ACADEMIC DISCIPLINE
«Computing and programming» for bachelors of the educational and professional
program «Electrical energetics, electrical engineering and electromechanics» of the
specialty 141 Electrical energetics, electrical engineering and electromechanics

Author:
Vita Yuriivna Kashtan

Editorial by the author