

INTERNATIONAL EUROPEAN UNIVERSITY
Education and Research Institute “European Business School”
Department of Information Technology

Approved by
The Scientific and Methodical Council of the
University, protocol dd. _____, 2023,
No. _____

Chair of SMC _____

WORKING PROGRAM OF THE ACADEMIC DISCIPLINE:
METHODS AND TOOLS OF COMPUTER INFORMATION
TECHNOLOGY

to train students of the first (Bachelor) level
(full-time and/or part-time mode of study)

Knowledge area: 12 Information Technology

Specialty: 121 Software Engineering

Educational program: 121 Software Engineering

Discipline status: Compulsory

The working program of the Methods and tools of computer information technology academic discipline is based on the 121 Software Engineering educational and professional program for the first (Bachelor) level of the 121 Software Engineering specialty approved by the University Academic Council on May 30, 2023, protocol No. 4.

Developer: Oleksandr Nesterenko, Doctor of Science (Techn.), professor

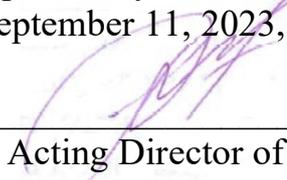
Reviewers: Zoia Sherman, PhD in Physics and Mathematics, associate professor
Oleksandr Falovskyi, PhD in Technology

Guarantor of the educational program: Oleksandr Nesterenko, Doctor of Science (Techn.), professor

The working program of the academic discipline is reviewed and approved by the Department of Information Technology, protocol dd. August 31, 2023, No. 1.

Head of the Department  O.V. Nesterenko, Doctor of Science (Techn.), professor

The program is reviewed and approved by the Academic Council of the European Business School, protocol dd. September 11, 2023, No. 1.

Chair of the Academic Council  Y.S. Remyha, PhD in Economics, associate professor, Acting Director of the European Business School

Registration No. _15/23

INTRODUCTION

The **program of the Methods and tools of computer information technology academic discipline** is designed according to the Higher Education Standard of Ukraine (hereinafter referred to as the Standard) of the knowledge area: 12 Information Technology, specialty: 121 Software Engineering.

Discipline description (annotation). It is one of the fundamental natural science disciplines for future software developers.

Table 1

Criteria	Knowledge area, training program, educational level	Discipline characteristics	
		full-time mode of study	part-time mode of study
Number of credits – 3	Knowledge area: 12 INFORMATION TECHNOLOGY	<u>Compulsory</u>	
Sections – 2	Specialty: 121 SOFTWARE ENGINEERING	Year of training	
Content sections – 4		2023-2024	2023-2024
Individual research task: startup		Semester	
		2 nd	2 nd
		Lectures	
Total amount of hours – 120		20 hours	4 hours
		Practical and laboratory classes	
Weekly load: class hours – 3 independent work of students – 4		Independent work	
	72 hours	108 hours	
	Type of control:		
	Pass/Fail test	Pass/Fail test	
	Educational level: Bachelor		

Subject matter of the academic discipline: basic concepts of computer science and contemporary information technologies and systems.

Interdisciplinary links: The academic discipline is the introduction to the Information Technology knowledge area.

1. GOAL AND OBJECTIVES OF THE ACADEMIC DISCIPLINE

1.1. The **goal** of the Methods and tools of computer information technology discipline is to provide students with knowledge of principles of creating information technologies and processes taking place during information processing,

as well as abilities and practical skills in working with basic information technology tools used in office, industrial and scientific activities.

1.2. **Objectives** of the Methods and tools of computer information technology discipline:

- to expand students’ knowledge about the contemporary information worldview and new areas of information technology development;
- to introduce different types of information systems and information technologies to students;
- to reveal the role and importance of information technologies in social development;
- to provide students with the understanding of core principles of creating information technologies and systems;
- to provide students with knowledge, abilities and skills in controlling information technology tools;
- to develop the ability to work with a specific class of software;
- to develop skills in applying obtained knowledge to solve typical tasks of information technology selection and application.

1.3. **Competencies and learning outcomes** encouraged by the discipline (interrelation with the statutory content of student training stipulated in learning outcome terms of the Standard).

According to the Standard requirements, the discipline provides students with the following *competencies*:

Table 2

<i>Integral competence</i>	Ability to solve complicated specialized tasks and practical problems in software and information technology development characterized by complexity and uncertainty of conditions.
<i>General competencies</i>	Understanding of the processes occurring during information processing using information technology tools. Ability to apply knowledge in practical situations. Ability to find, process and analyze information from different sources using information technology.
<i>Specialized (professional, subject) competencies</i>	Understanding of the concept of information and its processing. Ability to think algorithmically and logically. Understanding of the possibilities of practical application of information technology methods and tools.

Specification of competencies according to the National Qualifications Framework descriptors in the Competency matrix form is given in Table 3.

Table 3

Competency matrix

No.	Competence	Knowledge	Skills / Abilities	Communication	Autonomy and responsibility
Integral competence					

1.	Ability to solve complicated specialized tasks and practical problems in software and information technology development characterized by complexity and uncertainty of conditions.	experience in applying information technologies in different areas	To use information technologies, basic system and application software to solve practical problems	Human-machine interaction	Independent design and testing on the production site
General competencies					
2.	Understanding of the processes occurring during information processing using information technology tools. Ability to apply knowledge in practical situations. Ability to find, process and analyze information from different sources using information technology.	the structure of a computer, general principles of functioning of its main devices	perform operations using PC and peripheral devices, application and service software programs	Relation between theoretical and practical knowledge	Monitoring of information processing processes
Specialized (professional, subject) competencies					
3.	Understanding of the concept of information and its processing. Ability to think algorithmically and logically. Understanding of the possibilities of practical application of information technology methods and tools.	purpose, functionality and rules of use of basic system programs, Internet services, rules of information search and processing in the global network	the use of information technology software and hardware to prepare documents, presentations, perform calculations, etc.	Application of Internet technology for data collection and analysis	Description of information processes

Integrated final program learning outcomes encouraged by the academic discipline:

Program learning outcomes Bachelor's qualifying paper

Learning outcomes:

After learning the discipline, students should

know:

- the computer structure, general operation principles of its key devices;
- the role, functional capabilities and utilization rules of primary system software;
- the role, functional capabilities and utilization rules of general-purpose application programs;
- functional capabilities of basic Internet services, rules of information seeking and processing on the web;
- best practices in using information technologies in various sectors (science, management, mechanical engineering, construction, marketing, etc.).

be able to:

- use a computer, basic system and application programs to solve practical problems;
- conduct basic maintenance of the personal computer and its devices using service programs;
- use software tools to draw up documents, presentations, conduct calculations;
- apply database operation technologies, process and analyze data.

2. INFORMATION CAPACITY OF THE ACADEMIC DISCIPLINE

The Methods and tools of computer information technology academic discipline consists of 120 hours / 4 ECTS credits.

SECTION 1

CONTENT SECTION 1.

INTRODUCTION TO THE SUBJECT MATTER OF THE METHODS AND TOOLS OF COMPUTER INFORMATION TECHNOLOGY DISCIPLINE

Topic 1.1. Introduction to the discipline.

Topic 1.2. Key terms of information technology.

Topic 1.3. Data, information, solutions.

Topic 1.4. Theoretical basics of computing equipment.

CONTENT SECTION 2.

HARDWARE AND SOFTWARE

Topic 2.1. Hardware.

Topic 2.2. Software.

Topic 2.3. Computer networks.

SECTION 2

CONTENT SECTION 3. INFORMATION TECHNOLOGIES FOR OFFICE AND SCIENTIFIC ACTIVITIES

Topic 3.1. Key functions of office apps.

Topic 3.2. Text editor.

Topic 3.3. Spreadsheet operation software.

Topic 3.4. Database management systems.

Topic 3.5. Multimedia tools and computer graphics.

Topic 3.6. Modeling tools.

CONTENT SECTION 4. INFORMATION SYSTEMS

Topic 4.1. Enterprise management information systems.

Topic 4.2. Decision making systems and data analysis tools.

Topic 4.3. Embedded systems.

Topic 4.4. Artificial intelligence technologies.

3. STRUCTURE OF THE ACADEMIC DISCIPLINE

Content sections and topics	Amount of hours				
	Total	including			
		Lectures	Practical/seminars	Laboratory work	Independent work
1	2	3	4	5	
Section 1.					
Content section 1. Basic concepts of informatics					
<i>Topic 1.1.</i> Introduction to the discipline	1	1			
<i>Topic 1.2.</i> Key terms of information technology	5	1			4
<i>Topic 1.3.</i> Data, information, solutions	7	1		2	4
<i>Topic 1.4.</i> Theoretical basics of computing equipment	7	1		2	4
Total per section 1	20	4		4	12
Content section 2. Hardware and software					

<i>Topic 2.1.</i> Hardware	7	1		2	4
<i>Topic 2.2.</i> Software	7	1		2	4
<i>Topic 2.3.</i> Computer networks	6	2			4
Total per section 2	20	4		4	12
Section 2.					
Content section 3. Information technologies for office and scientific activities					
<i>Topic 3.1.</i> Key functions of office apps	4.6 6	0.6 6			4
<i>Topic 3.2.</i> Text editor	4.6 6	0.6 6			4
<i>Topic 3.3.</i> Spreadsheet operation software	10. 66	0.6 6		6	4
<i>Topic 3.4.</i> Database management systems	8.6 6	0.6 6		4	4
<i>Topic 3.5.</i> Multimedia tools and computer graphics	6.6 6	0.6 6		2	4
<i>Topic 3.6.</i> Modeling tools	6.6 6	0.6 6		2	4
Total per section 3	42	4		14	24
Content section 4. Information systems					
<i>Topic 4.1.</i> Enterprise management information systems.	10	2		2	6
<i>Topic 4.2.</i> Decision making systems and data analysis tools.	10	2		2	6
<i>Topic 4.3.</i> Embedded systems.	10	2		2	6
<i>Topic 4.4.</i> Artificial intelligence technologies.	8	2			6
Total per section 4	38	8		6	24
<i>Total</i>	120	20		28	72
<i>Consultations</i>					
<i>Pass/Fail test</i>					
Total hours					

4. TOPICS OF LECTURES

No.	Topics and list of key questions
1	<p>INTRODUCTION TO THE DISCIPLINE. Data and its accumulation. Data processing technology. Brief historical background of computer development. Areas of information technology implementation. Structure of the discipline and organization of its research. Safety rules.</p> <p>BASIC CONCEPTS OF INFORMATICS. Information society. Information technologies. Application areas of technologies.</p>
2	<p>DATA, INFORMATION, SOLUTIONS. Data, information, knowledge. Types of data. Format of data storage. Databases. Data stores. From data to solutions.</p> <p>THEORETICAL FOUNDATIONS OF COMPUTER SCIENCE. Theoretical foundations of computer science. Number systems. Logic and logic diagram. Algorithm. Algorithmic languages.</p>
3	<p>HARDWARE. Structural diagram of a computer. Microprocessor. External memory devices. Additional external devices. Input-output devices. Keyboard.</p> <p>SOFTWARE. Computer software. Main functions of operating systems, types of operating systems, file system. General information about Windows operating systems and Linux family. Standard operating system software (notepad, calculator, Paint graphic editor). General characteristics of computer viruses. Classification of viruses. Antivirus software. General characteristics of antivirus software. Archiving files. Working with archivers.</p>
4	<p>COMPUTER NETWORKS. Hardware, software and information components of a network. Network architecture. Internet. E-mail in the global network; principles of functioning. Creating, sending and receiving an e-mail message. Corporate e-mail. Search engines.</p>
5	<p>BASIC FUNCTIONS OF OFFICE APPLICATIONS. The concept of a document. Document processing technologies. Communicative support of activities.</p> <p>MS OFFICE WORD. General information about the Word text editor. Text input and editing. Columns. Formatting characters, paragraphs, pages. Working with lists. Working with pages, page breaks and sections. Creating tables and their formatting. Inserting and formatting illustrations. Wordart. Objects in MS Word and their formatting. Introduction and editing of mathematical formulas.</p> <p>MS OFFICE EXCEL SPREADSHEET SOFTWARE. Spreadsheet processing software. Input, editing of tabular data. Entering formulas. Working with book letters. Formatting of data. Development of tabular information using built-in functions. Processing of tabular information. Building diagrams. Processing tabular information using logical functions (CountIf, SumIf, etc.). Conditional formatting. Developing tabular information using the logical function If. Using functions and graphics to analyze tabular information.</p>

6	<p>MS OFFICE ACCESS DATABASE MANAGEMENT SYSTEM. Microsoft Office Access database management system. Creating table structure and data entry. Working with forms. Types of filters and their application. Working with queries. Creating queries based on several tables. Formatting reports.</p> <p>MULTIMEDIA AND COMPUTER GRAPHICS. MS Office Power Point application. Presentation preparation, the concept of markup and slide design, animation of objects. Creating presentations using Power Point. Customization of presentation demonstration, storage, insertion of video, sound. Machine graphics. Graphic editor. Working with graphic editor.</p> <p>MODELING TOOLS. Modeling as a way of information technology. Modeling in different activity areas. Modeling software. Instrumental software tools and environments (MathCad, MatLab, Mathematica, Maple, Derive, VisSim, Genius, etc.).</p>
7	<p>ENTERPRISE MANAGEMENT INFORMATION SYSTEMS. Definition and characteristics of management systems. Architecture of management information systems. Theoretical and practical foundations of the creation and design of enterprise management systems. Information and calculation analytical systems.</p>
8	<p>DECISION SUPPORT SYSTEMS AND DATA ANALYSIS TOOLS. Decision making process and methods. Knowledge engineering. Models and criteria in DSS. Fundamentals of knowledge. Basic approaches to the design of DSS. Examples of DSS construction.</p>
9	<p>EMBEDDED SYSTEMS. A combination of hardware and software with parts of devices designed to perform a separate function. Real-time operation. Types of integrated systems. Microprogramming. Monocrystal solutions and programmable chips.</p>
10	<p>ARTIFICIAL INTELLIGENCE TECHNOLOGIES. Theoretical and philosophical problems of artificial intelligence. The concept of neural networks. Genetic methods. Machine learning. Generative technologies. Processing and generation of natural speech. Robotics.</p>

5. TOPICS OF LABORATORY AND PRACTICAL CLASSES

No.	Laboratory work (computer workshop)	Amount of class hours
1	Data preparation and processing	2
2	Number systems	2
3	Logic	2
4	Algorithm	2
5	Hardware	2
6	Processing data lists using spreadsheets	2
7	Solving mathematical problems using spreadsheets	2
8	Summary tables	2
9	Saving and analyzing data in MS Office Access database management system.	2
10	Preparing presentations in MS Office Power Point. Working with graphic editor	2
11	Graphic and 3D-modeling tools	2
12	Enterprise management information systems	2
13	Decision support systems and data analysis tools	2
14	Embedded systems. Raspberry Kit.	2
	Total	28

6. INDEPENDENT WORK

No.	Topic to be studied independently	Amount of independent work hours
Content section 1. Basic concepts of informatics		
1	<i>Topic 1.2.</i> Key stages of development of informatics and information technology	4
2	<i>Topic 1.3.</i> The importance of data for decision-making support	4
3	<i>Topic 1.4</i> Theoretical foundations of computer science. Logic devices	4
Content section 2. Hardware and software		
4	<i>Topic 2.1.</i> Hardware. Architecture of modern computers	4
5	<i>Topic 2.2.</i> Software. Software for mobile devices	4
6	<i>Topic 2.3.</i> Local networks. Building local networks in offices	4
Content section 3. Information technologies for office and scientific activities		
7	<i>Topic 3.1.</i> Basic functions of office applications. Modern improvements of office applications	4
8	<i>Topic 3.2.</i> Text editor. Preparation of documents for publication	4
9	<i>Topic 3.3.</i> Software for working with spreadsheets. Using embedded functions for calculations and data analysis	4
10	<i>Topic 3.4.</i> Database management systems. Data exchange between databases and spreadsheets.	4
11	<i>Topic 3.5.</i> Multimedia and computer graphics. Raster and vector graphics.	4
12	<i>Topic 3.6.</i> Modeling tools. Basic functions and components of MatLab environment	4
Content section 4. Information systems		
13	<i>Topic 4.1.</i> Enterprise management information systems. Architecture of the automated process control system.	6
14	<i>Topic 4.2.</i> Decision support systems and data analysis tools. Basic tools of DataMining technology	6
15	<i>Topic 4.3.</i> Embedded systems. Digital service platforms	6
16	<i>Topic 4.4.</i> Artificial Intelligence technologies. Artificial neural networks and deep machine learning	6
		72

7. TRAINING METHODS

Teaching the Methods and tools of computer information technology discipline, one uses information and practical training methods: classical lectures, laboratory and practical classes using simulation laboratory workshops, as well as consultations on the accomplishment of independent work of students, written assignments during test works.

Methods of learning and cognitive activity: explanatory and illustrative method, reproductive method, problem presentation method, partially exploratory or heuristic method, research method.

Methods of stimulation and motivation of learning and cognitive activity: inductive and deductive teaching methods; methods of stimulation and motivation of learning.

8. CONTROL METHODS

The plan of the Methods and tools of computer information technology discipline implies carrying out of current and final control.

Current control is the assessment of the level of knowledge, skills and abilities of students carried out during the educational process by conducting a written survey at the end of sections (module colloquium). Modular control in special situations can be carried out in the form of a computer-based online test with a fixed answer time.

9. FORM OF STUDENT PERFORMANCE FINAL CONTROL

The form of final control is the **Pass/Fail test** taken on-campus in the period stipulated by the Dean's office or according to the individual schedule stipulated by the curriculum.

10. SCORING SYSTEM

Scoring during the semester

No.	Type of activity	Number of points per didactic unit	Number	Total points
1	Testing during lectures	1-2	10	20
2	Accomplishment of laboratory works	3-4	14	40
3	Pass/Fail test			40
Maximum grade				100

General assessment of student knowledge due to current control

The results of current control of student knowledge are assessed in general ranging from **0** to **60** points.

Students are allowed to final control if they fulfil the requirements of the training program and obtain at least **36** points for the current learning activity.

Final assessment of student knowledge

Final assessment of student knowledge is conducted in the form of **Pass/Fail test**.

Allocation of assessment points during final control in the academic discipline

Grade in points for final assessment	Grade according to the national scale
35-40	Excellent

21-34	Good
10-20	Satisfactory
less than 10	Fail

Assessing the answer to the particular question, one takes into account the following gaps and mistakes:

- untidy preparation of work (nonconventional abbreviations, unclear handwriting, use of pencils instead of clear inks) (minus 2 points);
- incorrectness in certain economic categories and definitions (minus 4 points).

Assessment criteria for answers to theoretical questions of the exam card:

1. The full answer to the question rated as *excellent* should correspond to the following requirements:

- detailed, comprehensive representation of the content of the given problem;
- full list of economic categories and laws required to reveal the question;
- ability to carry out a comparative analysis of various theories, concepts, approaches and make logical conclusions and generalizations;
- ability to apply methods for the scientific analysis of economic phenomena, processes and characterize their features and forms of appearance;
- demonstration of the ability to express and reason your own attitude to alternative views on this question;
- use of relevant actual and statistical data, knowledge of dates and historical periods that prove key points of the answer.

2. The answer to the question is rated as *good* if:

- the answer for the highest grade does not reveal at least one of the above-mentioned points (if it is definitely required to reveal the question comprehensively), or if:
- revealing the question correctly in general according to the above-mentioned requirements, one makes some mistakes while using digital materials.

3. The answer to the question is rated as *satisfactory* if:

- the answer for the highest grade does not reveal four and more points specified in its requirements (if they are required to reveal the question comprehensively);
- there are four or more gaps characterizing individually assessment criteria;
- conclusions made during the answer do not correspond to correct or generally defined ones with the absence of evidence for opposite facts given in the answer;
- the character of the answer gives reason to state that persons fail to understand the question properly or do not know the correct answer, and that is why fail to answer in actual fact, making serious mistakes.

National and ECTS grading scale

		Grade according to the national scale
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Sum of points for all types of educational activities	ECTS grade	for exam, term paper, practical training	for Pass/Fail test
90-100	A	excellent	pass
82-89	B	good	
74-81	C		
66-73	D	satisfactory	
60-65	E		
30-59	FX	fail with possible repeated pass	fail with possible repeated pass
1-29	F	fail with obligatory repeated learning of the discipline	fail with obligatory repeated learning of the discipline

The overall final grade in points according to the national and ECTS scales is put into the examination and test register, academic card and credit book of students.

11. METHODOLOGICAL SUPPORT:

- working program of the discipline;
- electronic course on the e-learning platform;
- plans of lectures, practical classes and independent work of students;
- key points of discipline lectures;
- methodical guidelines to laboratory and practical classes for students;
- laboratory instructions;
- methodical materials for independent work of students;
- test tasks for module colloquium;
- list of questions for the Pass/Fail test.

12. RECOMMENDED READING

Primary:

1. Nalyvaiko N.Y. Informatics. Study guide. K.: Center of educational literature. 2019. 576 p.
2. Morse N.V. Informatics: textbook for 11th grade of secondary schools: standard level. Kyiv: Shkoliar, 2012.
3. Informatics. 10th grade: level of standard: textbook for secondary school / Y. Y. Ryvkind [et al.]; edited by M. Zhurovskyi. – Kyiv: Heneza, 2010.
4. Informatics. 11th grade: textbook for secondary school: level of standard / Y. Y. Ryvkind [et al.]; edited by M. Zhurovskyi. – Kyiv: Heneza, 2011.
5. Matviienko M.P., Rozen V.P., Zakladnyi O.M. Computer architecture. K.: Lira-K Publishing house, 2013. 264 p.
6. Bondarenko M.F., Kachko O.H. Operating systems: study guide / Kharkiv: SMITH Company, 2008. 432 p.
7. Habrusiev V.Y., Lapinskyi V.V., Nesterenko O.V. Fundamentals of operating systems: Core, process, flow. Ternopil: Bohdan, 2007. 94 p.

8. Information systems and technologies in economy. Textbook / Edited by Ph.D. in Economics V. S. Ponomarenko. K.: Academy Publishing center, 2002. 542 p.

9. Fundamentals of information systems: Study guide. Ed. 2nd, revised and supplemented / V.F. Sytnyk, T.A. Pysarevska, N.V. Yeriomina, O.S. Kraieva; Edited by V.F. Sytnyk. K.: KNEU, 2001. 420 p.

10. Nesterenko O.V. Enterprise management information systems / Study guide. – Kyiv: UkrSC ITD, 2019. – 135 p.

11. Fundamentals of information technologies and systems: textbook / V. A. Pavlysh, L. K. Hlinenko, N. B. Shakhovska. Lviv: Lviv Polytechnic, 2018. 620 p.

Additional:

1. Hlynskyi Y.M. Informatics workshop. Study guide. – Lviv, 2008.

2. Pryima S.M. Mathematical logic and algorithm theory: Study guide – Melitopol: MMD Publishing house, 2010. – 196 p.

3. Hlynskyi Y.M. Internet: networks, HTML and telecommunications. Lviv: SPD Hlynskyi, 2009. – 238 p.

4. Ramskyi Y.S. Learning Internet search engines. – K.: National Pedagogical Dragomanov University, 2004. – 59 p.

5. Rudenko V.D. Databases in information systems. Study guide for students of pedagogical universities. – K.: Phoenix, 2010. – 240 p.

6. Yermoshenko M.M., Nesterenko O.V., Shtuler I.Y. Information technologies of data analysis in marketing: Study guide. Kyiv: National Academy of Management, 2021. 141 p.

Information resources:

1. <https://www.microsoft.com/uk-ua/>

2. <https://stud.com.ua/informatika/>

3. <https://dou.ua/>

4. <http://it.ridne.net/>

5. <https://www.globallogic.com/ua/>