

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
NATIONAL AVIATION UNIVERSITY
 Faculty of Linguistics and Social Communications
 Department of Philosophy

AGREED
 Dean of Faculty of Transport,
 Management and Logistics


 Tetiana MOSTENSKA
 «22» 09 2023

APPROVED
 Vice-Rector for Academics


 Anatolii POLUKHIN
 «25» 09 2023



Quality Management System


COURSE TRAINING PROGRAM
 on
«Logic»

Educational Professional Program: «Logistics»
 Field of study: 07 «Management and Administration»
 Speciality: 073 «Management»

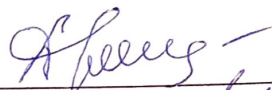
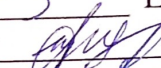
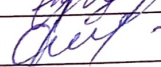
Form of study	Sem ester	Total (Hours / ECTS Credits)	Lectures	Practicals	Self-study	HW/ CGP/ C	TP/ CPr	Form of semester control
Full-time	3	120/4,0	34	17	69	-	-	Graded Test - 3 s.

Index CB-7-073-3/21-3.3

QMS NAU CTP 12.01.10-01-2023

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The Course Training Program on «Logic» is developed on the basis of the Educational Professional Program «Logistics», Bachelor Curriculum CB-7-073-3/21 and Extended Curriculum № ECB-7-073-3/23 for Speciality 073 «Management», and corresponding normative documents.

Developed by
Professor of the Department of Philosophy  Liubov DROTIANKO
Associate Professor of the Department of Philosophy  Oksana SKYBA
Associate Professor of the Department of Philosophy  Tetiana PODA

Discussed and approved by the Department of Philosophy, Minutes № 10 of «28» 08 2023.

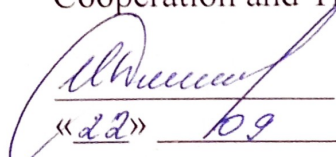
Head of the Department  Liubov DROTIANKO

Discussed and approved by the Graduate Department for Speciality 073 «Management» and Educational Professional Program «Logistics» - Logistics Department, Minutes № 16 of 18.09.2023.

Guarantor of the Educational and Professional Program  Volodymyr MARCHUK

Acting Head of the Department  Svitlana SMERICHEVSKA

Vice-Rector for International
Cooperation and Training

 Iryna ZARUBINSKA
«22» 09 2023

Document level – 3b

The Planned term between revisions – 1 year

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INTRODUCTION

Course Training Program on «Logic» is developed based on the «Methodical guidance for the subject course training program», approved by the order № 249/од, of 29.04.2021 and corresponding normative documents.

1. EXPLANATORY NOTES

1.1. Place, objectives, tasks of the subject

The discipline «Logic» is the theoretical and practical basis of formation of a personality's logical culture. Logic skilfully and effectively teaches to organize and lead a discussion, examine arguments for validity, be consistent in the conclusions and argumentation. The logical culture of the future specialist is an integral feature of his professionalism, part of the spiritual culture of man.

The purpose of studying the subject is the formation of a system of knowledge about the laws and principles of correct reasoning, forms of abstract thinking (concepts, propositions, and inferences), methods of debate, and the concept of logic as the basis of logical thinking development.

The tasks of the discipline study are:

- mastering the basic concepts and terms of logic;
- studying the forms of abstract thinking: concepts, judgments, and inferences;
- mastering the basic techniques and rules of construction of deductive, inductive, and traductive reasoning;
- mastering the concepts and terms of logic in the process of analysis of phenomena and processes in the professional activity;
- implementation of using content analysis of texts to analyze their coherence, consistency, and validity.

1.2. Learning outcomes the subject makes it possible to achieve:


As a result of the study of the subject, the student must achieve the following **program learning outcomes (PLO)**:

- demonstrate the skills to identify problems and justify management decisions (PLO4);
- identify the skills of searching, collecting and analyzing information, calculating indicators to justify management decisions (PLO6);
- demonstrate the skills of interaction, leadership, teamwork (PLO9);
- demonstrate skills of independent work, flexible thinking, openness to new knowledge, be critical and self-critical (PLO16);
- perform research individually and/or in a leader-led group (PLO17).

1.3. Competences the subject makes it possible to acquire:

As a result of studying the subject the student must acquire the following competencies (IC – integral competence, GC – general competence, PC – professional competence):

- the ability to solve complex specialized problems and practical problems that are characterized by complexity and uncertainty of conditions, in the field of logistics

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management or in the learning process, which involves the application of theories and methods of social and behavioral sciences (IC 1);

– the ability to thoroughly and consistently defend one's position based on thorough knowledge of logic (GC3);

– the ability to use the acquired theoretical knowledge of logic in professional logistics activities (GC4);

– the ability to learn and master modern knowledge (GC9);

– the ability to conduct research at the appropriate level (GC10);

– the ability to use knowledge of logical laws to generate new ideas in the logistics field and be creative (GC12);

– the ability to acquire flexible and critical thinking, the ability to critically assess personal virtues and shortcomings (GC17);

– the ability to work in a team and establish interpersonal interaction in solving professional problems (PC 9);

– the ability to clearly, logically, correctly and consistently build one's reasoning and draw true conclusions from them (PC11);

– the ability to analyze and structure the problems of the organization, to form informed decisions (PC 12).

1.4. Interdisciplinary Connections

The subject «Logic» is based on such subject as “Theory of Probability and Mathematical Statistics”, complements the knowledge of such subjects as “Business Statistics in Management” and “System approach in Logistics”. The knowledge and skills acquired during the study of the subject “Logic” are used further in the study of many subsequent disciplines of professional training, namely: “Philosophy” and others.

2. COURSE TRAINING PROGRAM ON THE SUBJECT

2.1. The subject content

Training material is structured according to the module principle and consists of **two educational modules, namely, Module № 1 «Logic is the science of thinking»** and **Module № 2 «Theory of inference and argumentation»**, which are logically complete, relatively independent, holistic part of the subject, learning of which provides module test of its performance.


2.2. Modular structuring and integrated requirements for each module

Module № 1 «Logic is the Science of Thinking»

Integrated requirements to the module №1:

Know:

- basic concepts of logic;
- peculiarities of abstract thinking and the content of basic formal and logical laws;
- basics of traditional and modern theories of concepts, judgments, inferences, hypotheses, proofs, etc.;

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- rules for building a correct opinion and drawing true conclusions from the results of knowledge;
- levels and forms of knowledge, methods of scientific knowledge, and their classification.

Learning skills:

- to use the means of traditional and modern logic in the analysis of thoughts expressed in natural language;
- to apply the acquired knowledge of logical laws, operations, methods, and techniques in the professional activity;
- to evaluate the truth or falsity of statements, avoid logical errors and recognize them in the reasoning of other people;
- to professionally and competently lead a discussion and convincingly defend one's point of view and the ability to criticize the opponent's point of view;
- to apply knowledge about the methods of scientific knowledge when understanding the processes occurring in nature and society.

Topic 1. The Subject and Meaning of Logic.

Logic and logistics: division of concepts. Reasoning as a subject of logic. Philosophical, modal, mathematical, and formal logics; their integration in cognition and practical activity. The subject and importance of formal logic in the professional economic activity. The main stages of development of logic. Traditional, classical, non-classical logic.

Topic 2. Formalization as a Method of Logic.

Sensory cognition and abstract thinking. Sensation, perception, representation. Concepts, judgments, inferences as forms of abstract thinking. Reasoning and its structure. Logical validity and invalidity of reasoning, validity and invalidity of statements. The importance of logic for managers in logistics.

Formalization, abstraction, idealization. Formalization is a method of logic and methodology of logistics. The language of algebra of expressions. Logical connectives.

Topic 3. Laws of Formal Logic.


The concept of law. Types of laws and their interconnection. Laws of formal logic: law of identity, law of non-contradiction, law of the excluded middle and sufficient reason. Principles of correct thinking. The place of laws of formal logic in managerial activity. Logical laws of thinking and the logic of systems development.

Topic 4. Laws of Propositional Logic.

The logic of the Stoics as a theoretical basis of logistics. Formulas of the propositional logic: tautologies, logical contradictions and executable formulas. Solving problems by the method of tables of validity.

Topic 5. Concept as a Form of Abstract Thinking

Semantics and semiotics. Name, sense, meaning, word. A concept is a form of thought. Linguistic means of expression. Procedures for the formation of concepts. The

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content and scope of the concept. The law of the inverse relationship between scope and content. Types of concepts. Operations on sets. The concept as a set. Logical relations between concepts: union of sets, intersection of sets, complement of sets, Cartesian product of sets. Logical operations between concepts: compatibility and incompatibility relationship.

Topic 6. Logical Operations on Concepts

Logical analysis of logistics concepts. Limitation and generalization of concepts. Separation of concepts. Definition. Types and characteristics of definitions. Definition rules. Classification, description, characteristics. Aspect definitions of logistics.

Topic 7. Judgment as a Form of Abstract Thinking

General characteristics of judgment as a form of thinking. Structure of judgment: the subject, predicate and conjunction. Linguistic means of expressing judgments. Types of judgments. Simple and complex inferences. Division of simple judgments by quantity and quality. Distribution of terms in simple categorical judgments. Intuitive logic and modal judgments in logistics. Decision-making logic.

Topic 8. Counting of Predicates

Logical square. The relationship between the main types of categorical judgments. The language of predicate algebra. Quantifiers of generality and existence. Formal record of complex judgments. Questions and answers. Types and structure of questions. Types of answers. Answer rules. Situationality, variability, alternativeness as a logistic apparatus for analyzing situations. Operations research as a method of substantiating logistics decisions.

Module № 2 «Theory of inference and argumentation»

Integrated requirements to the module №1:

Know:

- peculiarities of abstract thinking and the content of basic formal and logical laws;
- basics of traditional and modern theories of concepts, judgments, inferences, hypotheses, proofs, etc.;
- rules for building a correct opinion and drawing true conclusions from the results of knowledge;
- levels and forms of knowledge, methods of scientific knowledge, and their classification;
- principles and rules of arguing, logical and rhetorical techniques of argumentation.

Learning skills:

- to apply the acquired knowledge of logical laws, operations, methods, and techniques in the professional activity;
- to evaluate the truth or falsity of statements, avoid logical errors and recognize them in the reasoning of other people;
- to professionally and competently lead a discussion and convincingly defend one's point of view and the ability to criticize the opponent's point of view;



- to apply knowledge about the methods of scientific knowledge when understanding the processes occurring in nature and society;
- use logical and rhetorical techniques in the process of professional communication.

Topic 9. Inference as a Form of Thinking. Non-Mediated Deductive Reasoning

General characteristics of inference. Types and structure of inferences. Relations of deduction, induction and analogy. Deductive reasoning: signs, properties, scope of applicability. Limits of applicability of deduction in the practice of a logistics manager. Deductive reasoning. Reasoning by the Logical Square.

Topic 10. Mediated Deductive Reasoning

Purely conditional, conditionally categorical, dividing-categorical, conditionally-dividing. Dilemmas. Simple categorical syllogism.

Topic 11. Complex and Compound Abbreviated Deductive Reasoning

Abbreviated syllogisms: entimema and epicheirema. Complex syllogisms: progressive and regressive polysyllogisms. Abbreviated polysyllogisms: Aristotelian and Hocklenian sorites. Methodology of system analysis and modeling of the structure of logistics systems.

Topic 12. Inductive Inference

General characteristics of inductive inference. Relationship between induction and deduction in science and practice. Induction and its types. Complete and incomplete induction. Mathematical induction. The concept of causation. Methods of establishing causal relationships. Increasing the truth of inductive reasoning. Errors in inductive inferences. Synergetics as a science of complex self-developing systems. The logic of synergism.


Topic 13. Inference by Analogy

The essence of inference by analogy. Types of analogies: analogy of properties and analogy of relations. Valid and false analogy. Rules of inference by analogy. Cognitive value of analogy. Modeling and cybernetic models in logistics.

Topic 14. Hypothesis

Hypothesis as a form of knowledge development. Logical nature and role of hypothesis in cognition. Types of hypotheses. Rules for formulating of hypotheses. Stages of hypothesis developing. Methods of testing hypotheses. Refutation of hypotheses: direct and indirect. Functions of hypotheses in scientific research. Version as a kind of hypothesis. Methods confirming and refuting versions. Problem. Theory. Types and structure of theories. Criteria of the correctness of theories.

Problem, hypothesis and theory in the activities of the logistics manager. Methodological and methodological bases of forecasting in logistics.

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Topic 15. Proving and Refutation

The essence and meaning of proof. Logical structure of proof. Types of proofs. Logical rules and errors in proof. Refutation as a form of proof. Logical rules and errors in refutations.

Sales management as a method of dynamic response to deviations.

Topic 16. Logical and Psychological Foundations of the Theory of Argumentation

Logical and rhetorical techniques of argumentation. Debate, dispute, dialogue, discussion, polemics. Classification and structure of disputes. Principles and rules of dispute management. Logical and rhetorical techniques in the discussion.

Logical modeling of conflict. Analysis, phases and reversion of the conflict. Rational communication in conflict. Logic, ethics and law. Principles and pitfalls in controversy. Black rhetoric as a method of gathering and concealing economic information.


Topic 17. Multi-valued and Modal Logic

Multivalued logics of Ya. Lukasevich, E. Post, Brauer-Gaiting. Modal logics: alethic, temporal, epistemic, deontic. Modal logics and "possible worlds". Application of multi-valued and modal logics in the work of a logistics specialist.

2.3. Training schedule of the subject



№	Theme (thematic section)	Total, hour			
		Total	Lectures	Practical Classes	Self- study
1	2	3	4	5	6
3 semester					
Module №1 «Logic is the Science of Thinking»					
1.1	The Subject and Meaning of Logic.	8	2	–	6
1.2	Formalization as a method of logic.	7	2	2	3
1.3	Laws of Formal Logic.	5	2	–	3
1.4	Laws of Propositional Logic.	7	2	2	3
1.5	Concept as a Form of Abstract Thinking	5	2	–	3
1.6	Logical Operations on Concepts	7	2	2	3
1.7	Judgment as a Form of Abstract Thinking.	5	2	–	3
1.8	Counting of Predicates.	10	2	–	8
1.9	Module Test №1	4		2	2
Total by the module №1		58	16	8	34
Module №2 «Theory of Inference and Argumentation»					
2.1	Inference as a Form of Thinking. Non-Mediated deductive reasoning.	6	2	–	4
2.2	Mediated Deductive reasoning.	8	2	2	4
2.3	Complex and Compound Abbreviated Deductive reasoning.	6	2	–	4
2.4	Inductive Inference.	6	2	2	2
2.5	Inference by Analogy.	4	2	–	2
2.6	Hypothesis	8	2	2	4
2.7	Proving and Refutation.	6	2	–	4
2.8	Logical and Psychological Foundations of the Theory of Argumentation	8	2	2	4
2.9	Multi-valued and Modal Logic	6	2	-	4
2.10	Module Test 2	4		1	3
Total by the module №2		62	18	9	35
Total by the semester		120	34	17	69
Total by the subject		120	34	17	69

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3. BASIC CONCEPTS OF GUIDANCE ON THE SUBJECT

3.1. Teaching methods

It is recommended to use the following teaching methods during mastering the subject: - explanatory and illustrative method; - method of problem presentation; - reproductive method; - research method.

The implementation of these methods are carried out during lectures, practical classes, self-study, analysis and solution of problems.

3.2. List of references

Basic literature

3.2.1. Dowden B. H. Logical reasoning. Belmont, Calif : Wadsworth Pub. Co., 2020. 404 p.

3.2.2. Walton D., Macagno F. Legal Argumentation (Informal Logic). *Encyclopedia of the Philosophy of Law and Social Philosophy*. Dordrecht, 2022. P. 1–10. URL: https://doi.org/10.1007/978-94-007-6730-0_729-1.

3.2.3. Jayprakash V. A., Erickson A. Logic & critical reasoning. conceptual foundations and techniques of evaluation. URL: <https://www.sjsu.edu/people/anand.vaidya/courses/c4/s2/Logic-and-Critical-Reasoning-Book.pdf>.

3.2.4. Magnus P., Button T. An introduction to formal logic. University of Calgary, 2020.

3.2.5. Philosophy (Philosophy. Logic. Religion Studies. Ethics. Aesthetics). 2012. Ed. Larisa V. Kadnikova. Kyiv: National Aviation University.

3.2.6. Priest G. Logic: A Very Short Introduction (Very Short Introductions). Oxford University Press, USA, 2000. 144 p.

3.2.7. Smith P. Introduction to Formal Logic. University of Cambridge ESOL Examinations, 2020.

Additional Literature


3.2.8. Dwyer C. P. Inference. *Critical Thinking*. Cambridge. P. 117–128. URL: <https://doi.org/10.1017/9781316537411.009>

3.2.9. Necessary and Sufficient Conditions. *Logic in Wonderland*. 2018. P. 181–198. URL: https://doi.org/10.1142/9789813208681_0009

3.2.10. Introduction to Logic: Pearson New International Edition / C. Cohen et al. Taylor & Francis Group, 2016. 654 p.

3.2.11. Vartiak L., Jaseckova G., Konvit M. Logic as a Tool for Developing Critical Thinking. *Rupkatha Journal on Interdisciplinary Studies in Humanities*. 2023. Vol. 15, no. 2. URL: <https://doi.org/10.21659/rupkatha.v15n2.15>.

3.2.12. Pietroski P. On Davidson's "The Logical Form of Action Sentences". *Studies in Linguistics and Philosophy*. Cham, 2022. P. 89–102. URL: https://doi.org/10.1007/978-3-030-85308-2_6 (date of access: 25.10.2023).

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3.2.13. Vartiak L., Jaseckova G., Konvit M. Logic as a Tool for Developing Critical Thinking. *Rupkatha Journal on Interdisciplinary Studies in Humanities*. 2023. Vol. 15, no. 2. URL: <https://doi.org/10.21659/rupkatha.v15n2.15>.

3.2.14. Origins of Hierarchical Logical Reasoning / A. M. Dedhe et al. *Cognitive Science*. 2023. Vol. 47, no. 2. P. 13250. URL: <https://doi.org/10.1111/cogs.13250>

3.2.15 Necessary and Sufficient Conditions. *Logic in Wonderland*. 2018. P. 181–198. URL: https://doi.org/10.1142/9789813208681_0009

3.3. Internet Information resource

3.3.1. Repository of NAU: <https://er.nau.edu.ua/handle/NAU/3>


3.3.2. STLibrary of NAU: <https://www.lib.nau.edu.ua/>

4. RATING SYSTEM OF KNOWLEDGE AND SKILLS ASSESSMENT

4.1. Assessment of certain kinds of student academic activity is carried out in accordance with Table 4.1.

Table 4.1

Kind of academic activity	Grade values	Kind of academic activity	Grade values
3 semester			
Module № 1 «Logic is the Science of thinking»		Module №2 «Theory of inference and argumentation»	
The answer for practical classes (8 points x 2)	16	The answer for practical classes (8 points x 2)	16
Carrying out express tasks for practical classes	20	Carrying out express tasks for practical classes	20
<i>For admission to complete module test №1, a student must receive not less than</i>	22	<i>For admission to complete module test №1, a student must receive not less than</i>	22
Carrying out Module Test №1	14	Carrying out Module Test №2	14
Total by Module №1	50	Total by Module №2	50
Total by the Modules 1,2			100
Total by subject			100

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The Graded Test Grade is determined (in grades and on a national scale) based on the results of all kinds of academic activities during the semester.

4.2. A student gets a credit for the completed assignment if the student's performance has been assessed positively (Appendix 1).

4.3. The total of Grades for individual academic activities completed by a student constitutes a Current Semester Module Grade, which is entered into the Module Control Register.

4.4. The total of the Current Module Grade and Module Test Grade constitutes Graded Test Grade, which is converted into a grade on the national scale and the ECTS scale (Appendix 2).

4.5. The Graded Test Grade is entered in an Examination Register, a student's record book and academic card, e.g.: **92/Ex/A, 87/Good/B, 79/Good/C, 68/Sat/D, 65/Sat./E**, etc.

4.6. The Total Grade on the subject corresponds to the Graded Test Grade.
The Total Grade on the subject is entered into Diploma Supplement.



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Appendix 1

Correspondence of rating in points to rating in the national scale

Rating in points												Rating in the national scale
3	4	5	6	7	8	9	10	11	13	14	15	
3	4	5	6	7	8	9	9-10	10-11	12-13	13-14	14-15	Excellent
2,5	3	4	5	6	6-7	7-8	8	9	10-11	11-12	12-13	Good
2	2,5	3	4	4-5	5	6	6-7	7-8	8-9	9-10	9-11	Satisfactory

Rating in points												Rating in the national scale
16	17	18	19	20	21	22	23	24	25	26	27	
15-16	16-17	17-18	17-19	18-20	19-21	20-22	21-23	22-24	23-25	24-26	25-27	Excellent
12-14	13-15	14-16	15-16	15-17	16-18	17-19	18-20	18-21	19-22	20-23	20-24	Good
10-11	10-12	11-13	12-14	12-14	13-15	13-16	14-17	15-17	15-18	16-19	16-19	Satisfactory

Rating in points												Rating in the national scale
28	29	30	31	32	33	34	35	36	37	38	39	
26-28	26-29	27-30	28-31	29-32	30-33	31-34	32-35	33-36	34-37	34-38	35-39	Excellent
21-25	22-25	23-26	23-27	24-28	25-29	26-30	27-31	27-32	28-33	29-33	29-34	Good
17-20	18-21	18-22	19-22	19-23	20-24	20-25	21-26	22-26	22-27	23-28	24-28	Satisfactory

Rating in points												Rating in the national scale
40	41	42	43	44	45	46	47	48	49	50	51	
36-40	37-41	38-42	39-43	40-44	41-45	42-46	43-47	43-48	44-49	45-50	46-51	Excellent
30-35	31-36	32-37	32-38	33-39	34-40	35-41	35-42	36-42	37-43	38-44	38-45	Good
24-29	25-30	25-31	26-31	27-32	27-33	28-34	28-34	29-35	30-36	30-37	31-37	Satisfactory

Rating in points												Rating in the national scale
52	53	54	55	56	57	58	59	60	61	62	63	
47-52	48-53	49-54	50-55	51-56	51-57	52-58	53-59	54-60	55-61	56-62	57-63	Excellent
39-46	40-47	41-48	41-49	42-50	43-50	44-51	44-52	45-53	46-54	47-55	47-56	Good
31-38	32-39	32-40	33-40	34-41	34-42	35-43	36-43	36-44	37-45	37-46	38-46	Satisfactory

Rating in points												Rating in the national scale
64	65	66	67	68	69	70	71	72	73	74	75	
58-64	59-65	60-66	60-67	61-68	62-69	63-70	64-71	65-72	66-73	67-74	68-75	Excellent
48-57	49-58	50-59	50-59	51-60	52-61	53-62	53-63	54-64	55-65	56-66	56-67	Good
38-47	39-48	40-49	40-49	41-50	41-51	42-52	43-52	43-53	44-54	44-55	45-55	Satisfactory


Rating in points												Rating in the national scale
76	77	78	79	80	81	82	83	84	85	86	87	
68-76	69-77	70-78	71-79	72-80	73-81	74-82	75-83	76-84	77-85	77-86	78-87	Excellent
57-67	58-68	59-69	59-70	60-71	61-72	62-73	62-74	63-75	64-76	65-76	65-77	Good
46-56	46-57	47-58	47-58	48-59	49-60	49-61	50-61	50-62	51-63	52-64	52-64	Satisfactory



Appendix 2

Correspondence of the final semester rating grade to the grade based on the national scale and the ECTS scale

Grade in points	Grade in national scale	Grade in the ECTS scale	
		Grade	Definition
90-100	Excellent	A	Excellent (outstanding performance but with only minor errors)
82-89	Good	B	Very good (above the average standard but with some errors)
75-81		C	Good (generally sound work with a number of notable errors)
67-74	Satisfactory	D	Satisfactory (fair but with significant shortcomings)
60-66		E	Sufficient (performance meets the minimum criteria)
35-59	Fail	FX	Fail (some more work required before the credit can be awarded)
1-34		F	Fail (considerable further work is required)

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АРКУШ РЕЄСТРАЦІЇ РЕВІЗІЇ

№ пор.	Прізвище ім'я по-батькові	Дата ревізії	Підпис	Висновок щодо адекватності

(Ф 03.02 – 03)


АРКУШ ОБЛІКУ ЗМІН

№ зміни	№ листа (сторінки)				Підпис особи, яка внесла зміну	Дата внесення зміни	Дата введення зміни
	Зміненого	Заміненого	Нового	Анульованого			

(Ф 03.02 – 32)

УЗГОДЖЕННЯ ЗМІН

	Підпис	Ініціали, прізвище	Посада	Дата
Розробник				
Узгоджено				
Узгоджено				
Узгоджено				
Узгоджено				

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АРКУШ РЕЄСТРАЦІЇ РЕВІЗІЇ

№ пор.	Прізвище ім'я по-батькові	Дата ревізії	Підпис	Висновок щодо адекватності

(Ф 03.02 – 03)

АРКУШ ОБЛІКУ ЗМІН

№ зміни	№ листа (сторінки)				Підпис особи, яка внесла зміну	Дата внесення зміни	Дата введення зміни
	Зміненого	Заміненого	Нового	Анульованого			

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УЗГОДЖЕННЯ ЗМІН

	Підпис	Ініціали, прізвище	Посада	Дата
Розробник				
Узгоджено				
Узгоджено				
Узгоджено				
Узгоджено				