

Ministry of education and science of ukraine  
Sumy national agrarian university  
Cybernetics and Informatics Department  
Faculty of Economics and Management

Module syllabus

*Information systems and technologies for applied and scientific research*

(mandatory)

<b>Specialty</b>	D3 Management
<b>Educational professional program</b>	Management of Organizations and administration
<b>Higher education level</b>	2(Master)

**Sumy - 2025**

Розробник: Світлана АГАДЖАНОВА Світлана АГАДЖАНОВА, кандидат технічних наук, доцент кафедри кібернетики та інформатики

Розглянуто, схвалено та затверджено на засіданні кафедри кібернетики та інформатики	протокол від 04.06.2025 р. №19
	Завідувач кафедри <u>Світлана АГАДЖАНОВА</u> (підпис) Світлана АГАДЖАНОВА

Погоджено:

Гарант освітньої програми Альвіна ОРЕХОВА Альвіна ОРЕХОВА

Декан факультету,  
де реалізується освітня програма Світлана ЛУКАШ Світлана ЛУКАШ

Рецензія на робочу програму (додається) надана: \_\_\_\_\_

Методист відділу якості освіти,  
ліцензування та акредитації

В'ячеслав (В'ячеслав) В'ячеслав

Зареєстровано в електронній базі: дата: 25.06. 2025 р.

**Syllabus review data:**

The academic year in which changes are made	The Academic program attachment number with changes description	Changes revised and approved		
		Minutes No and date of the department meeting	Head of Department	Guarantor of the Academic program

## 1. MODULE OVERVIEW

1.	Title	Information systems and technologies for applied and scientific research		
2.	Faculty/Department	Economics and Management/Cybernetics and Informatics		
3.	Type (compulsory or optional)	mandatory		
4.	Program(s) to which module is attached (to be filled in for compulsory types)	Management/ D3 Management		
5.	Module can be suggested for (to be filled in for optional types)			
6.	Level of the National Qualifications Framework	7-th		
7.	Semester and duration of module	1 semester		
8.	ECTS credits number	5		
9.	Total workload and time allotment	Directed study		
		Lectures	Practicals	Labs
		30	-	30
		90		
10.	Language of instruction	english		
11.	Module leader	Svitlana Ahadzhanova, Associated Pofessor, Ph.D Consultation hours – every Tuesday at 12:15, room 308		
12.	Module leader contact information	s.agadzhanova@snau.edu.ua		
13.	Module description	The study of the discipline “Information Systems and Technologies for Applied and Scientific Research” is based on the principles of integrating various knowledge acquired by master's students during their bachelor's studies in natural sciences and engineering disciplines. The discipline “Information Systems and Technologies for Applied and Scientific Research” is designed to help applicants in carrying out scientific work on the topic of their master's thesis.		
14.	Module aim	The aim of the course is to provide professional training and equip master's students with a comprehensive knowledge of the possibilities and prospects for using information systems and technologies in scientific research, as well as the application of information products in scientific research, processing research results, and their presentation.		
15.	Module Dependencies (prerequisites, co-requisites, incompatible modules)	1. The educational component is the basis for EC12 “Preparation of qualification work and certification.”		
16.	The policy of academic integrity	The academic integrity policy at Sumy National Agrarian University is defined by the documents presented on the page: <a href="https://snau.edu.ua/viddil-zabezpechennya-yakosti-osviti/zabezpechennya-yakosti-osviti/akademichna-dobrochesnist/">https://snau.edu.ua/viddil-zabezpechennya-yakosti-osviti/zabezpechennya-yakosti-osviti/akademichna-dobrochesnist/</a> Academic integrity of PhD candidates is an important condition for mastering the results of learning in the educational component and receiving the appropriate grades from current and final tests.		

		<p>In case of violation of academic integrity by a PhD candidate (cheating, plagiarism, fabrication), the work is assessed as unsatisfactory and must be redone. In this case, the teacher reserves the right to change the topic of the assignment.</p> <p>For violations of academic integrity, candidates for a Doctor of Philosophy degree may be subject to the following academic penalties:</p> <ul style="list-style-type: none"> <li>– retaking the assessment (test, exam, credit, etc.);</li> <li>– retaking the relevant educational component of the educational program.</li> </ul> <p>The exam may be retaken with the permission of the vice-rector for scientific, pedagogical, and educational work if there are valid reasons (e.g., sick leave).</p>
17	Key words	Information system, information technology, systemic-structural approach, optimization methods.
18	Link in Moodle	<a href="https://cdn.snau.edu.ua/moodle/course/view.php?id=6215">https://cdn.snau.edu.ua/moodle/course/view.php?id=6215</a>

## 2. CORRELATION BETWEEN MODULE LEARNING OUTCOMES (MLOs) AND PROGRAM LEARNING OUTCOMES (PLOs)

Learning outcomes for EC: After studying the educational component, the higher education applicant is expected to be able to	Program learning outcomes that the OC aims to achieve (indicate the number according to the numbering given in the OP)			How learning outcomes are assessed
	PLO 1.	PLO 8.	PL13	
MLOs1. Apply knowledge in practical situations and use modern information technologies to study technical and social processes.	x			Multiple choice tests, calculation tasks
MLOs 2. Conduct research at the PhD level using information and communication technologies			x	Multiple choice tests, calculation tasks
MLOs 3. Collect, process, and analyze information published on Internet resources; present the results of professional activities using modern information technologies and software products.	x			Multiple choice tests, calculation tasks
MLOs 4. Select and effectively use modern software for conducting scientific research		x		Multiple choice tests, calculation tasks

### 3. MODULE INDICATIVE CONTENT

Topics	Distribution of hours			Self-directed study	Learning resources
	Directed study				
	Lectures	Practicals	Labs		
<b>Topic 1. Data and information.</b> 1. Introduction 2. Data 3. Information 4. Properties of information 5. Types of data	2	2		10	Basic: 2, 4 Methodological: 1 Additional: 1-3
<b>Topic 2. Economic information.</b> 2.1 The concept of economic information 2.2 Features of economic information 2.3 Types of data	2	2		10	Basic: 1, 3 Methodological: 1 Additional: 1-3
<b>Topic 3. Information technology, information system.</b> 1. Introduction. 2. The 4I concept. 3. Definition of the term IT. 4. Classification of IT. 5. Information system, definition. 6. Structure of IS.	2	2		10	Basic: 1-4 Methodological: 1 Additional: 1-3
<b>Topic 4. Methods of data analysis.</b> What-if analysis. 4.1 Definition. 4.2 Types. Characteristics. Practical application of the method.	2	2		10	Basic: 1 Additional: 1-2
<b>Topic 5. Methods of data analysis.</b> Pivot table. 5.1. Definition, characteristics. 5.2. Algorithm for solving typical problems. 5.3. Advantages of using the method.	2	2		10	Basic: 1-3 Additional: 1-3
<b>Topic 6. Regression analysis.</b> 6.1. Basic concepts 6.2. The main task of RA 6.3. Stages of solving problems using the least squares method. 6.4. Stages of solving practical problems in spreadsheets.	4	4		20	Basic: 1-4 Additional: 2
<b>Topic 7. Correlation and regression analysis</b> Correlation... 7.1. Definition. 7.2. Methods of solving practical problems. 7.3. Analysis of 3 variants of the	4	4			Basic: 1-3 Additional: 1-3

results of correlation analysis. 7.4 Scatterplots					
<b>Topic 8.</b> Database basics 8.1 Definitions. Basic concepts 8.2 Classification of databases. 8.3 Software for database development 8.4 Structure of the database	<b>4</b>	<b>4</b>		<b>20</b>	Basic: 1-4 Additional: 1-3
<b>Topic 9.</b> Data analysis. Logical functions. Conditional formatting. 9.1 Types of logical functions 9.2 Types of conditional formatting. 9.3 Practical application of logical functions and conditional formatting to solve typical tasks..	<b>4</b>	<b>4</b>			Basic: 1-3 Additional: 1-3
<b>Topic 10.</b> Optimisation. Linear programming 10.1 Basic concepts 10.2 Classification of LP methods. 10.3 The simplex method. 10.4 Transport problem. 10.5 Assignment problems	<b>6</b>	<b>6</b>		<b>10</b>	Basic: 1-4 Methodological: 1 Additional: 1
<b>Total hours</b>	<b>30</b>	<b>30</b>		<b>90</b>	

#### 4. TEACHING AND LEARNING METHODS

<b>MLOs</b>	<b>Teaching methods (directed study)</b>	<b>Hours</b>	<b>Learning methods (self-directed study)</b>	<b>Hours</b>
MLOs1. Apply knowledge in practical situations and use modern information technologies to study technical and social processes.	Lecture, practical lesson, discussion of topical issues	15	Elaboration of theoretical material, solution of calculation tasks	15
MLOs 2. Conduct research at the PhD level using information and communication technologies	Lecture, practical lesson, discussion of topical issues	15	Elaboration of theoretical material, solution of calculation tasks	15
MLOs 3. Collect, process, and analyze information published on Internet resources; present the results of professional activities using modern information technologies and software products.	Lecture, practical lesson, discussion of topical issues	15	Elaboration of theoretical material, solution of calculation tasks	30
MLOs 4. Select and effectively use modern software for conducting scientific research	Lecture, practical lesson, discussion of topical issues	15	Elaboration of theoretical material, solution of calculation tasks	30

Total hours		60		90
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## 5. ASSESSMENT

### 5.1. Diagnostic assessment

### 5.2. Summative assessment

#### 5.2.1. Intended learning outcomes methods:

No	Summative assessment methods	Grades	Deadline
<b>Autumn semester</b>			
1.	Practical Work 1-4	40 points / 40 %	7 week
2.	Practical Work 5-9	45points / 45 %	14 week
3.	Test	15 points / 15 %	During semester

#### 5.2.2. Grading criteria

Summative assessment method	Unsatisfactory	Satisfactory	Good	Excellent
<b>Practical Works 1-4.</b>	<i>0-10 points</i>	<i>11-20 points</i>	<i>21-30 points</i>	<i>31-40 points</i>
	Task not completed (method and answers are incorrect)	The progress is correct, but there are significant errors, the answers are mostly wrong	The task is completed, but there are minor errors	Task completely done. Mistakes missing
<b>Practical Works 5-9</b>	<i>0-10 points</i>	<i>11-20 points</i>	<i>21-30 points</i>	<i>31-45 points</i>
	Task not completed (method and answers are incorrect)	The progress is correct, but there are significant errors, the answers are mostly wrong	The task is completed, but there are minor errors	Task completely done. Mistakes missing
<b>Multiple choice test</b>	<i>0-3 points</i>	<i>4-7 points</i>	<i>8-10 points</i>	<i>11-15 points</i>
	Depends on the number of correct answers to the test	Depends on the number of correct answers to the test	Depends on the number of correct answers to the test	Depends on the number of correct answers to the test

### 5.3. Formative assessment

Formative exercises are designed to enable students to develop particular aspects of their learning, prior to summative assessments. Formative exercises are designed to help students use feedback and self-reflection to manage and develop their learning so that they can see how to improve their work.

No	Formative Assessment elements	Date
1.	Oral interview after studying each topic	After completing the study of the topic
2.	Passing the test on certification and modular control with feedback from the teacher	According to the schedule of the educational process



3.	Passing the test after the end of the study of each topic for independent control of knowledge and preparation for the test (exam)	Regulated by the student independently
4.	Protection of practical works	One week after their delivery
5.	Oral feedback from the teacher while working on practical work during classes	Throughout the semester

Self-assessment can be used both as an element of formative and summative assessment.

## 6. LEARNING RESOURCES

### 6.1. Key resources

1. Ivanova, L., Kaverinskiy, V., Kotlyk, S., et al. (2024). Modern information technologies in scientific research and educational activities. Iowa State University Digital Press.
2. Punziano, G., & Delli Paoli, A. (Eds.). (2021). Handbook of Research on Advanced Research Methodologies for a Digital Society. IGI Global.
3. Schuster, K., & Dunn, S. (Eds.). (2021). Routledge International Handbook of Research Methods in Digital Humanities. Routledge.
4. Stair, R., Reynolds, G., & Baldauf, J. (2022). Fundamentals of Information Systems (10th Ed. or latest). Cengage Learning

### 6.2 Methodical resources

1. S.Ahadzhanova Information Systems and Technologies for Applied and Scientific Research(e-course in Moodle:Address – <https://cdn.snau.edu.ua/moodle/course/view.php?id=6215>

### 6.2.2 Additional resources

1. Monograph: Ahadzhanova S. Improving the system of social services provision using the digital technologies // Sustainable development in the era of digital transformation: challenges and opportunities for management / scientific ed. Nataliya Stoyanets. - Warsaw: RS Global Sp. z O.O., 2025. 289-302 pp. DOI: <https://doi.org/10.31435/rsglobal/062-18>
2. Mental Rotation Ability and Preferences in Vocational Education. [Електронний ресурс] / Svitlana Ahadzhanova, Oleksandr Burov, Evgeniy Lavrov, Karen Ahadzhanov-Honsales, Olena Hlazunova, Oleksandr Viunenko// Advances in Intelligent Systems and Computing. Volume 1322. Springer Nature Switzerland AG 2021 D. Russo et al. (Eds.): IHSI 2021, AISC 1322, pp. 267–272, 2021. [https://doi.org/10.1007/978-3-030-68017-6\\_40](https://doi.org/10.1007/978-3-030-68017-6_40)
3. Oleksandr Yu. Burov, Nadiia B. Pasko, Oleksandr B. Viunenko, Svitlana V. Agadzhanova, Karen H. Ahadzhanov-Honsales. Using intelligent agent-managers to build personal learning environments in the e-learning system. AREdu 2024: 7th International Workshop on Augmented Reality in

Education, May 14, 2024, Kryvyi Rih, Ukraine. 125-133pp. <https://ceur-ws.org/Vol-3918/paper296.pdf>

## 6.2 Soft ware

1. Google Analytics. URL: <https://107.com.ua/blog/iak-vstanoviti-1%D1%96chilnik-google-analytics-nasv%D1%96i-sait/>
2. Microsoft Office 265.

