

NATIONAL UNIVERSITY OF LIFE AND  
ENVIRONMENTAL SCIENCES OF UKRAINE

Department of Higher and Applied Mathematics

"APPROVED"

Dean of the Faculty of Agricultural  
Management

Anatolii OSTAPCHUK

2024

"APPROVED"

at the meeting of the Department of Higher  
and Applied Mathematics

Minutes №13 of 06.05.2024

Head of the Department

Yuliia MEISH

"REVIEWED"

Guarantor of the AP "Management of  
international business"

Oleksandr FAICHUK

**CURRICULUM OF ACADEMIC DISCIPLINE**

**HIGHER MATHEMATICS**

Field of knowledge: 07 "Management and administration"

Specialty: 073 "Management"

Academic programme: Management of international business

Faculty of Agricultural Management

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(position, academic degree, academic rank)

Kyiv – 2024

## Description of the discipline

Higher mathematics*(name)*

<b>Academic degree, specialty, academic programme</b>		
Academic degree	<i>Bachelor</i>	
Field of knowledge	<i>07 "Management and administration"</i>	
Specialty	<i>073 "Management"</i>	
Academic programme	<i>Management of international business</i>	
<b>Characteristics of the discipline</b>		
Type	<i>compulsory</i>	
Total number of hours	120	
Number of ECTS credits	4	
Number of modules	2	
Course project (work) (if any)	—	
Form of assessment	<i>Exam</i>	
<b>Indicators of the discipline for full-time and part-time forms of university study</b>		
	Full-time	Part-time
Year of study	1	1
Semester	1	1
Lectures	<i>15 hours</i>	<i>4 hours</i>
Practical classes and seminars	<i>45 hours</i>	<i>2 hours</i>
Laboratory classes	—	—
Self-study	<i>60 hours</i>	<i>114 hours</i>
Number of hours per week for full-time students	<i>4 hours</i>	—

## 1. Aim, objectives, competences and expected learning outcomes of the discipline

The **aim** of the educational discipline “Higher Mathematics” is to form students' personalities, develop their intelligence and abilities to logical and algorithmic thinking, master mathematical methods for solving managerial problems in the economic sphere.

The main **objectives** of the discipline “Higher Mathematics” are as follows:

- mastery of the basics of the mathematical apparatus necessary for solving theoretical and practical management problems in the economic sphere;
- development of skills in mathematical research of applied problems, namely, the ability to translate a specific economic problem into mathematical language with the subsequent construction of its mathematical model;
- development of the ability to research the constructed mathematical models of certain management processes.

As a result of studying the discipline, the student should acquire the following **competencies**:

### ***Integral competences (IC):***

The ability to solve complex specialized tasks and practical problems characterized by complexity and uncertainty of conditions in the field of management or in the learning process, which involves the application of theories and methods of social and behavioral sciences.

### ***General competences (GC):***

GC 8. Skills in the use of information and communication technologies.

### ***Special (professional) competences (SC):***

SC 2. Ability to analyze the results of the organization's activities, compare them with the factors of influence of the external and internal environment.

SC 10. Ability to evaluate the work performed, ensure its quality and motivate the staff of the organization.

SC 12. Ability to analyze and structure the problems of the organization, to formulate to formulate reasonable solutions.

### **Expected Learning Outcomes (ELO):**

ELO 6. To demonstrate skills in searching, collecting and analyzing information, calculating indicators to justify management decisions.

**2. Programme and structure of the discipline for:**  
full-time (part-time) form of study

Modules and topics	Number of hours												
	full-time						part-time						
	in total	including					in total	including					
		l	p	lab	ind	s.st		l	p	lab	ind	s.st	
1	2	3	4	5	6	7	8	9	10	11	12	13	
<b>Module 1: Linear and vector algebra.</b>													
<b>Topic 1.</b> Determinants.	<b>6</b>	<b>1</b>	<b>2</b>			<b>3</b>							
<b>Topic 2.</b> Matrices.	<b>10</b>	<b>1</b>	<b>4</b>			<b>5</b>							
<b>Topic 3.</b> Systems of linear equations, their application in solving economic and management tasks.	<b>16</b>	<b>2</b>	<b>6</b>			<b>8</b>							
<b>Topic 4.</b> Linear economic models: • Leontiev model (balance analysis). • Model of equilibrium prices. • Linear model of equilibrium trade.	<b>16</b>	<b>2</b>	<b>6</b>			<b>8</b>							
<b>Total for module 1</b>	<b>48</b>	<b>6</b>	<b>18</b>			<b>24</b>	<b>2</b>	<b>1</b>					<b>45</b>
<b>Module 2. Differential and integral calculus.</b>													
<b>Topic 1.</b> Application of functions in economic theory.	<b>6</b>	<b>1</b>	<b>2</b>			<b>3</b>							
<b>Topic 2.</b> The limit of a function. Continuity of function.	<b>10</b>	<b>1</b>	<b>4</b>			<b>5</b>							
<b>Topic 3.</b> The derivative of a function. Differential function.	<b>8</b>	<b>1</b>	<b>4</b>			<b>3</b>							
<b>Topic 4.</b> Application of the derivative for the study of the function when solving problems of an economic and managerial nature.	<b>10</b>	<b>1</b>	<b>4</b>			<b>5</b>							
<b>Topic 5.</b> Definition of antiderivative and indefinite integral.	<b>14</b>	<b>1</b>	<b>6</b>			<b>7</b>							
<b>Topic 6.</b> The definite integral. Application of the definite integral to geometric and economic problems.	<b>12</b>	<b>1</b>	<b>5</b>			<b>6</b>							

<b>Topic 7.</b> Definition of DE of the 1st order.	<b>6</b>	<b>1</b>	<b>2</b>		<b>3</b>					
<b>Topic 8.</b> Linear DEs of the 2nd order with constant coefficients.	<b>6</b>	<b>1</b>	<b>2</b>		<b>3</b>					
<b>Total for module 2</b>	<b>72</b>	<b>9</b>	<b>27</b>		<b>36</b>	<b>72</b>	<b>2</b>	<b>1</b>		<b>69</b>
<b>Total hours</b>	<b>120</b>	<b>15</b>	<b>45</b>		<b>60</b>	<b>—</b>	<b>4</b>	<b>2</b>		<b>114</b>

### 3. Topics of practical classes

No	Topic title	Hours
1	<b>Topic 1.</b> Determinants.	2
2	<b>Topic 2.</b> Matrices.	4
3	<b>Topic 3.</b> Systems of linear equations, their application in solving economic and management tasks.	6
4	<b>Topic 4.</b> Linear economic models.	6
5	<b>Topic 5.</b> Application of functions in economic theory.	2
6	<b>Topic 6.</b> The limit of a function. Continuity of function.	4
7	<b>Topic 7.</b> The derivative of a function. Differential function.	4
8	<b>Topic 8.</b> Application of the derivative for the study of the function when solving problems of an economic and managerial nature.	4
9	<b>Topic 9.</b> Definition of antiderivative and indefinite integral.	6
10	<b>Topic 10.</b> The definite integral. Application of the definite integral to geometric and economic problems.	5
11	<b>Topic 11.</b> Definition of DE of the 1st order.	2
12	<b>Topic 12.</b> Linear DEs of the 2nd order with constant coefficients.	2

### 4. Topics for self-study

No s/n	Topic title	Hours
1	<b>Topic 1.</b> Determinants. Determinants of the nth order.	3
2	<b>Topic 2.</b> Matrices. Rank of a matrix. Inverse matrix.	3
3	<b>Topic 3.</b> Systems of linear equations, their application in solving economic and management tasks. Gauss method. SLAE compatibility. Homogeneous SLAE	8
4	<b>Topic 4.</b> Linear economic models. Leontiev's model of n-branches.	8
5	<b>Topic 5.</b> Application of functions in economic theory. Graphs of functions.	3
6	<b>Topic 6.</b> The limit of a function. Continuity of function.	5
7	<b>Topic 7.</b> The derivative of a function. Differential function.	7

	Derivative of higher orders. Differential of a function.	
8	<b>Topic 8.</b> Application of the derivative for the study of the function when solving problems of an economic and managerial nature.	6
9	<b>Topic 9.</b> Definition of antiderivative and indefinite integral. Integration methods.	5
10	<b>Topic 10.</b> The definite integral. Application of the definite integral.	6
11	<b>Topic 11.</b> Linear DE of the 1st order.	3
12	<b>Topic 12.</b> Linear DEs of the 2nd order with constant coefficients.	3

### **Tasks for individual work of students**

I. Students perform individual work on the following topics during the course of the discipline:

1. Application of linear algebra in management.
2. Study of the function.
3. The integral

#### **5. Tools for assessing expected learning outcomes:**

- exam.

#### **6. Teaching methods:**

- verbal method (lecture, discussion, interview, etc.);
- practical method (practical classes);
- visual method (illustration, demonstration);
- processing learning resources (note-taking, summarising, reviewing, writing an abstract);
- video method (remote, multimedia, web-based, etc.);
- self-study (completing assignments);
- individual research work (completion of tasks);
- individual research work of higher education students.

#### **7. Assessment methods:**

- exam;
- oral or written assessment;
- module tests;
- team projects;
- essays and reports;
- presentation of practical works;
- presentations and speeches at scientific and practical events.

#### **8. Distribution of points received by students**

The assessment of students' knowledge and skills is conducted by means of a 100-point scale and is converted into national grades according to Table 1 of the current *Exam and Credit Regulations at NULES of Ukraine*.

Student's rating,	National grading of exams and credits
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points	exams	credits
90-100	excellent	pass
74-89	good	
60-73	satisfactorily	
0-59	unsatisfactorily	fail

To determine a student's rating in the discipline  $R_{DIS}$  (up to 100 points), the received assessment rating  $R_A$  (up to 30 points) is added to the academic performance rating  $R_{AP}$  (up to 70 points):  $R_{DIS} = R_{AP} + R_A$ .

## 9. Teaching and learning aids

1. E-learning course of the discipline "Higher Mathematics" on the educational portal of National University of Life and Environmental Sciences of Ukraine eLearn. URL: <https://elearn.nubip.edu.ua/course/view.php?id=1284>.
2. Artemchuk L.M. Lecture notes and their presentations in electronic form. URL: <https://elearn.nubip.edu.ua/course/view.php?id=1284>.
3. Artemchuk L.M. Methodical recommendations for practical classes and individual tasks in electronic form. URL: <https://elearn.nubip.edu.ua/course/view.php?id=1284>.
4. Batechko N.G., Pantalienko L.A., Shostak S.V., Tsypiy T.I., Ruzhylo M.Y. Higher Mathematics. Collection of tasks. Kyiv: NULES Publishing House, 2021. 352 pp.

## 10. Recommended sources of information

1. Yeremina T.O., Povarova O.A. Higher Mathematics. Elements of linear algebra and analytical geometry: a textbook. Igor Sikorsky Kyiv Polytechnic Institute; Kyiv: Igor Sikorsky Kyiv Polytechnic Institute, 2021. 115 pp. URL: <https://ela.kpi.ua/handle/123456789/41267>
2. Pasichnyk YA Higher mathematics: a textbook. Ostroh: Publishing House of the National University of Ostroh Academy, 2021. 432 c
3. Panchenko N. G. Rezunenکو M. E. Higher mathematics: a textbook. Part 1 - Kharkiv: UkrDUZT, 2022. 232 pp. URL: <http://lib.kart.edu.ua/handle/123456789/10149>
4. Batechko N.G., Pantalienko L.A., Khaidurov V.V., Tsyupiy T.I., Shostak S.V. Mathematics textbook for students of preparatory courses. Kyiv: FOP Yamchynskyi O.V., 2020. 248 pp.