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
" 26" 08 20 24

"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 "Marketing"
_____ Violeta HERAIMOVYCH

CURRICULUM OF ACADEMIC DISCIPLINE

HIGHER MATHEMATICS

Field of knowledge: 07 "Management and administration"

Specialty: 075 "Marketing"

Academic programme: Marketing

Faculty of Agricultural Management

Author(s): Associate Professor **Artemchuk L.M.**, Candidate of Pedagogy, Associate Professor, Professor **Shydlich A.L.**, Doctor of Science (Physics & Mathematics), Senior research fellow

(position, academic degree, academic rank)

Kyiv – 2024

Description of the discipline Higher mathematics
(name)

Academic degree, specialty, academic programme	
Academic degree	*Bachelor*
Field of knowledge	*07 "Management and administration"*
Specialty	*075 "Marketing"*
Academic programme	*Marketing*
Characteristics of the discipline	
Type	*compulsory*
Total number of hours	120
Number of ECTS credits	4
Number of modules	2
Course project (work) (if any)	—
Form of assessment	*Exam*

Indicators of the discipline for full-time and part-time forms of university study	Full-time	Part-time
Year of study	1	1
Semester	1	1
Lectures	*15 hours*	*4 hours*
Practical classes and seminars	*45 hours*	*2 hours*
Laboratory classes	—	—
Self-study	*60 hours*	*114 hours*
Number of hours per week for full-time students	*4 hours*	—

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: students acquire knowledge of the main sections of higher mathematics, prove basic theorems, form initial skills: performing actions on vectors, matrices, calculating determinants; solving systems of linear equations; studying the forms and properties of lines and planes, curves and surfaces of the second order; finding the limit of power-exponential functions.

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 in the field of marketing activities or in the learning process, which involves the application of relevant theories and methods and is characterized by complexity and uncertainty of conditions.

General competences (GC):
GC 8. Ability to conduct research at the appropriate level.
GC 9. Skills in the use of information and communication technologies.

Special (professional) competences (SC):
SC3. Ability to use the theoretical provisions of marketing to interpret and predict phenomena and processes in the marketing environment.
SC6. Ability to conduct marketing research in various areas of marketing activities.
SC7. Ability to determine the impact of functional areas of marketing on the results of economic activity of market participants.
SC14. Ability to propose improvements to the functions of marketing activities.

Expected Learning Outcomes (ELO):
ELO 14. To perform functional duties in the group, to offer reasonable marketing solutions.

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
Module 1: Linear and vector algebra.												
Topic 1. Determinants.	6	1	2			3						
Topic 2. Matrices.	10	1	4			5						
Topic 3. Systems of linear equations, their application in solving economic and management tasks.	16	2	6			8						
Topic 4. Linear economic models: • Leontiev model (balance analysis). • Model of equilibrium prices. • Linear model of equilibrium trade.	16	2	6			8						
Total for module 1	48	6	18			24	2	1				45
Module 2. Differential and integral calculus.												
Topic 1. Application of functions in economic theory.	6	1	2			3						
Topic 2. The limit of a function. Continuity of function.	10	1	4			5						
Topic 3. The derivative of a function. Differential function.	8	1	4			3						
Topic 4. Application of the derivative for the study of the function when solving problems of an economic and managerial nature.	10	1	4			5						
Topic 5. Definition of antiderivative and indefinite integral.	14	1	6			7						
Topic 6. The definite integral. Application of the	12	1	5			6						

4

definite integral to geometric and economic problems.											
Topic 7. Definition of DE of the 1st order.	6	1	2		3						
Topic 8. Linear DEs of the 2nd order with constant coefficients.	6	1	2		3						
Total for module 2	72	9	27		36	72	2	1			69
Total hours	120	15	45			60	—	4	2		114

3. Topics of practical classes

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

4. Topics for self-study

№ s/n	Topic title	Hours
1	**Topic 1**. Determinants. Determinants of the nth order.	3
2	**Topic 2**. Matrices. Rank of a matrix. Inverse matrix.	3
3	**Topic 3**. Systems of linear equations, their application in solving economic and management tasks. Gauss method. SLAE compatibility. Homogeneous SLAE	8
4	**Topic 4.** Linear economic models. Leontiev's model of n-branches.	8

5	**Topic 5**. Application of functions in economic theory. Graphs of functions.	3
6	**Topic 6**. The limit of a function. Continuity of function.	5
7	**Topic 7**. The derivative of a function. Differential function. Derivative of higher orders. Differential of a function.	7
8	**Topic 8**. Application of the derivative for the study of the function when solving problems of an economic and managerial nature.	6
9	**Topic 9.** Definition of antiderivative and indefinite integral. Integration methods.	5
10	**Topic 10**. The definite integral. Application of the definite integral.	6
11	**Topic 11**. Linear DE of the 1st order.	3
12	**Topic 12.** 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, points	National grading of exams and credits	
	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 raiting 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=3832.

2. Lecture notes and their presentations in electronic form. URL: https://elearn.nubip.edu.ua/course/view.php?id=3832.

3. 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

4. Pasichnyk Y.A. Higher mathematics: a textbook. Ostroh: Publishing House of the National University of Ostroh Academy, 2021. 432 pp.

10. Recommended sources of information

1. Panchenko N.G. Rezunenko M.E. Higher mathematics: a textbook. Part 1 - Kharkiv: UkrDUZT, 2022. 232 pp. URL:

http://lib.kart.edu.ua/handle/123456789/10149

2.Batechko N.G., Pantalienko L.A., Shostak S.V., Tsypiy T.I., Ruzhylo M.Y. Higher mathematics. Collection of tasks. - K.: NUBiP Publishing House, 2021 - 352 pp.

3. 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.