

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ  
ХАРКІВСЬКИЙ НАЦІОНАЛЬНИЙ ЕКОНОМІЧНИЙ УНІВЕРСИТЕТ  
ІМЕНІ СЕМЕНА КУЗНЕЦЯ



Проректор з навчально-методичної роботи

Каріна ПЕМАШКАЛЮ

**ВИЩА МАТЕМАТИКА У МІЖНАРОДНОМУ БІЗНЕСІ**

**робоча програма навчальної дисципліни**

Галузь знань **29 Міжнародні відносини**

Спеціальність **292 Міжнародні економічні відносини**

Освітній рівень **перший (бакалаврський)**

Освітня програма **Міжнародний бізнес**

Статус дисципліни **обов'язкова**

Мова викладання, навчання та оцінювання **англійська**

Завідувач кафедри  
вищої математики та  
економіко-математичних методів

Людмила МАЛЯРЕЦЬ

Харків  
2021

THE MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE  
SIMON KUZNETS KHARKIV NATIONAL UNIVERSITY  
OF ECONOMICS



"APPROVED"

Vice-Rector responsible for educational and methodical work

Karina NEMASHKALO

**HIGHER MATHEMATICS IN INTERNATIONAL BUSINESS**

syllabus of the academic discipline

Branch of knowledge     **29 International Relations**

Specialty                 **292 International Economic Relations**

Level of education     **first (bachelor)**

Academic program     **International business**

Discipline status

Language of teaching, training and assessment

**Compulsory**

**English**

*Head of the Department of  
Higher Mathematics,  
Economic and Mathematical Methods*

Lyudmyla MALYRETS

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Kharkiv  
2021

APPROVED

At the meeting of the Department of *Higher Mathematics*

*Economic and Mathematical Methods*

Protocol № 1 dated 27.08.2021

Completed by:

S. Lebedev, senior teacher of the *Department of Higher Mathematics,*

*Economic and Mathematical Methods*

**Sheet of renewal and re-approved of syllabus of the academic discipline**

Academic year	Data of the department meeting – the developer of syllabus of the academic discipline	Protocol number	Signature of the chief of the department

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ІМЕНІ СЕМЕНА КУЗНЕЦЯ**

**"ЗАТВЕРДЖУЮ"**

Проректор з навчально-методичної роботи

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Каріна НЕМАШКАЛО

**ВИЩА МАТЕМАТИКА У МІЖНАРОДНОМУ БІЗНЕСІ**

**робоча програма навчальної дисципліни**

Галузь знань	<b><i>29 Міжнародні відносини</i></b>	
Спеціальність	<b><i>292 Міжнародні економічні відносини</i></b>	
Освітній рівень	<b><i>перший (бакалаврський)</i></b>	
Освітня програма	<b><i>Міжнародний бізнес</i></b>	
Статус дисципліни		<b><i>обов'язкова</i></b>
Мова викладання, навчання та оцінювання		<b><i>англійська</i></b>

Завідувач кафедри  
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## Abstract of the Discipline

The current stage of globalization of the world economy and the formation of the information society determine the active use of the mathematical apparatus in all spheres of practical activity in general and in international business in particular. The application of mathematical methods and models in solving practical problems of economics and management allows: to improve economic information systems by organizing them, identifying shortcomings in existing information and developing requirements for the preparation of new information or its adjustment; increase the accuracy of economic calculations; conduct research that suggests the existence of several alternatives; identify and justify optimal solutions; deepen the quantitative analysis of economic problems; to solve fundamentally new economic problems.

Today it is noticeable the transition to new areas of application of mathematical methods in the development of socio-economic solutions that will determine the future of our country, namely: investment policy planning, modernization of enterprises, forecasting environmental processes, determining both state and private interests in development international projects and so on. In solving these management problems, the leading place is occupied by the methods and means of computational mathematics. Therefore, every future economist, business leader, business owner needs a thorough mathematical training that forms analytical and research competencies, as well as the ability to apply mathematical tools to solve a wide range of problems in their professional activities.

**The main purpose of this discipline is:** the formation of a holistic system of theoretical knowledge of the mathematical apparatus, which helps to model, analyze and solve economic problems; assistance in mastering mathematical methods that make it possible to study and predict processes and phenomena in the field of future professional activity; development of logical and algorithmic thinking; promoting the formation of skills and abilities of independent analysis of the study of economic problems, the development of the desire for scientific search for ways to improve their work.

### Characteristics of the academic discipline

Academic year	<b>1</b>
Term	<b>1</b>
Number of credits ECTS	<b>5</b>
Form of final control	<b>Exam</b>

### Structural and logical scheme of studying the academic discipline

Previous academic disciplines	Next academic disciplines
Algebra (Mathematics)	Information and analytical tools of international business
Geometry (Mathematics)	International trade in goods, services, technologies
	Economic diplomacy

### Competences and result of mastering the academic discipline

Competences	Learning outcomes
3K2. Ability to preserve and increase moral, cultural, scientific values and achievements of society based on understanding the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, technology and technology, use different types and forms of physical activity for active recreation and a healthy lifestyle	PH24. To substantiate the choice and apply information-analytical tools, economic-statistical methods of calculation, complex analysis techniques and methods of monitoring the situation on world markets
3K 8. Ability to abstract thinking, analysis and synthesis	PH12. Carry out a comprehensive analysis of complex economic systems, compare and contrast their components, evaluate and justify evaluations of the effectiveness of their functioning. PH13. To select and skillfully apply analytical tools to study the state and prospects of development of certain segments of international markets for goods and services using modern knowledge of methods, forms and tools for regulating international trade. PH24. To substantiate the choice and apply information-analytical tools, economic-statistical methods of calculation, complex analysis techniques and methods of monitoring the situation on world markets
CK5. Ability to carry out a comprehensive analysis and monitoring of world markets, assess changes in the international environment and be able to adapt to them	PH4. Systematize and organize the received information on processes and phenomena in the world economy; assess and explain the impact of endogenous and exogenous factors on them; formulate conclusions and develop recommendations taking into account the peculiarities of the national and international environment

<b>Competences</b>	<b>Learning outcomes</b>
CK 11. Ability to conduct research on economic phenomena and processes in the international sphere, taking into account causal and spatio-temporal relationships	PH3. Use modern information and communication technologies, software packages of general and special purpose. PH18. To study economic phenomena and processes in the international sphere on the basis of understanding of categories, laws; highlighting and summarizing trends, patterns of functioning and development of the world economy, taking into account causal and spatio-temporal relationships. PH24. To substantiate the choice and apply information-analytical tools, economic-statistical methods of calculation, complex analysis techniques and methods of monitoring the situation on world markets
CK 12. Ability to use regulatory documents and reference materials in carrying out professional activities in the field of international economic relations	PH27. Apply the acquired knowledge to solve applied problems in the areas of planning, analysis, organization and control of international business

**The syllabus of the academic discipline**  
**The themes of lectures**

**Thematic module 1. Linear algebra and functions**

- Theme 1. Elements of the theory of matrices and determinants.
- Theme 2. General theory of systems of linear algebraic equations.
- Theme 3. Functions and graphics.

**Thematic module 2. Elements of probability theory and mathematical statistics**

- Theme 4. Empirical and logical foundations of probability theory. The classical definition of probability.
- Theme 5. Conditional probability, dependent and independent events. Full group of events. The formula of total probability. Bayesian formula.
- Theme 6. Bernoulli's scheme. Discrete random variables, distribution law, basic characteristics.
- Theme 7. Continuous random variables. Uniform, exponential and normal distribution laws.
- Theme 8. Selective method. Numerical characteristics of the sample.
- Theme 9. Elements of correlation-regression analysis. Correlation of qualitative indicators.

The list of practical and laboratory classes, as well as questions and tasks for independent work is given in the table "Rating-plan of the discipline".

**Teaching and learning methods**

During the teaching of the discipline "Higher Mathematics in International Business" in order to enhance the educational and cognitive activities of students such interactive forms of teaching provides for the use. There are presentations, visual support banks, "Flipped classroom", interactive distance learning, creative independent work. The application of these technologies is aimed at the formation of competencies that are defined for each topic of the discipline.



*Presentations* are speeches to the audience, used to present the results of individual tasks (for each theme of the discipline), a report on the implementation of creative independent work. Presentations can be individual or collective (a group of two to five students).

*Visual support banks* help to intensify the learning process on the discipline with the help of clarity (for each theme of the discipline).

*"Flipped classroom"* is a principle of learning, according to which the main assimilation of new material by students takes place at home, and classroom time is allocated for tasks, exercises, laboratory and practical research, individual teacher consultations and more.

*Interactive distance learning* is a set of pedagogical technologies based on the principles of communication in the information educational space, serving to organize the education of users, distributed in space and time (for each theme of the discipline, if classes on this theme are on-line).

*Creative independent work* involves writing a scientific article or thesis report, which highlights the economic problem and demonstrates the possibilities of using mathematical tools to solve it (the topic is chosen by the student himself from the list of themes which are teaching).

### **The order of assessment of studying results**

The system of assessment of formed competencies of students during the study of this discipline takes into account the types of classes that, according to the curriculum of the discipline, include lectures, practical classes, laboratory work, as well as students' independent work. Assessment of competencies formed in students is carried out on a cumulative 100-point system.

Control measures include:

current control, carried out during the semester during lectures, practical classes and laboratory works and evaluated by the amount of points scored. In the first semester, the maximum amount is 100 points; the minimum amount that allows a student to get a credit of 60 points. In the second semester, the maximum amount is 60 points; the minimum amount that allows a student to take the exam is 35 points;

final / semester control, carried out in the form of a semester exam, according to the schedule of the educational process.

**Current control** is carried out within a term during:

lectures – in the form of colloquia (during the semester students write two colloquia; the maximum number of points for both colloquia is 16 points);

practical classes – in the form of tasks of written tests in practical classes (during the semester students perform two written tests; the maximum number of points for two tests is 14 points);

laboratory classes – in the form of defense of the report on laboratory work (during the semester students perform 6 laboratory works; the maximum number of points for the performance of six laboratory works is 12 points);

independent work:

in the form of homework (during the semester, students complete six homework assignments – the maximum number of points for completing six homework assignments is 12 points);

in the form of creative work (during the semester students perform one creative work – the maximum number of points is 6).

**Final control** of knowledge and competencies of students in the discipline is carried out on the basis of a semester exam, the task of which is to test students' understanding of the program material in general, logic and relationships between individual sections, ability to creatively use accumulated knowledge, ability to formulate their attitude to a particular problems of academic discipline, etc.

The examination ticket covers the program of the discipline and provides for the determination of the level of knowledge and the degree of mastery of competencies by students.

Each exam ticket consists of 5 practical situations (two stereotypical, two diagnostic and one heuristic task), which provide for the solution of typical and professional tasks and allow to diagnose the level of theoretical training of the student and his level of competence in the discipline.

The result of the semester exam is evaluated in points (maximum number – 40 points, minimum number of credits – 25 points) and is affixed in the appropriate column of the examination "Information of success".

**It should be assessed student's progress**, if a sum of points, obtained as the total result of an assessment by all forms of a control, equals or exceeds 60. Accordingly the minimal possible quantity of points by a current and a module control during a term equals 35 and the minimal possible quantity of points, obtained on an exam, equals 25.

The final grade in the discipline is calculated taking into account the points obtained during the exam and the points obtained during the current control of the accumulative system. The total result in points for the semester is: "60 or more points – credited", "59 or less points – not credited" and is entered in the "Statement of performance" of the discipline.

The final grade is set according to the scale given in the table "Grade scale: national and ECTS". Forms of assessment and distribution of points are given in the table "Rating-plan of the discipline".

### The scales of assessment: national and ECTS

Sum of points including all forms of study	Mark on the ECTS scale	Mark on the national scale	
		for an exam, a term paper, practice	for a test
90 – 100	A	excellent	passed
82 – 89	B	good	
74 – 81	C		
64 – 73	D		
60 – 63	E	satisfactory	failed
35 – 59	FX	unsatisfactory	
1 – 34	F		

### Rating-plan of the discipline

Theme	Forms and types of teaching	Forms of evaluation	Max points	
Theme 1	<i>Classroom work</i>			
	Lecture	<i>Lecture №1.</i> Elements of the theory of matrices and determinants	–	–
	Practical lesson	<i>Practical task №1.</i> Actions on matrices on the example of problems of economic content	Homemade work	2
	<i>Individual work</i>			
	Questions and tasks for self-study	Search, selection and review of literary sources on the subject of the discipline. Study of lecture material	–	–

	<b><i>Classroom work</i></b>			
	Lecture	<b><i>Lecture №2.</i></b> Elements of the theory of matrices and determinants (the end)	–	–
	Laboratory lesson	<b><i>Laboratory task №1.</i></b> Calculation of determinants using elementary transformations	LW №1	2
	<b><i>Individual work</i></b>			
Questions and tasks for self-study	Study of lecture material, calculations in MS Excel	–	–	
<b>Theme 2</b>	<b><i>Classroom work</i></b>			
	Lecture	<b><i>Lecture №3.</i></b> General theory of systems of linear algebraic equations	–	–
	Practical lesson	<b><i>Practical task №2.</i></b> Solving systems of linear equations	Homemade work	2
	<b><i>Individual work</i></b>			
	Questions and tasks for self-study	Search, selection and review of literary sources on a given topic. Doing homework	–	–
	<b><i>Classroom work</i></b>			
	Lecture	<b><i>Lecture №4.</i></b> General theory of systems of linear algebraic equations (the end)	–	–
	Laboratory lesson	<b><i>Laboratory task №2.</i></b> Investigation of the system of linear equations in MS Excel. Determining the general solution of a system of linear algebraic equations	LW №2	2
<b><i>Individual work</i></b>				
Questions and tasks for self-study	Study of lecture material, preparation for practical classes, solving problems using MS Excel	–	–	
<b>Theme 3</b>	<b><i>Classroom work</i></b>			
	Lecture	<b><i>Lecture №5.</i></b> Functions and graphics		
	Practical lesson	<b><i>Practical task №3.</i></b> Investigation of the function of one variable. Plotting functions	Homemade work	2
	<b><i>Individual work</i></b>			
	Questions and tasks for self-study	Study of lecture material, preparation for practical classes. Doing homework	–	–
	<b><i>Classroom work</i></b>			
	Lecture	<b><i>Lecture №6.</i></b> Functions and graphics (the end)	Colloquium №1	8
	Laboratory lesson	<b><i>Laboratory task №3.</i></b> Graphical interpretation of empirical data	LW №3	2
<b><i>Individual work</i></b>				
Questions and tasks for self-study	Search, selection and review of literary sources on a given topic. Execution of practical tasks. Preparation for the colloquium	–	–	

Theme 4	<b>Classroom work</b>			
	Lecture	<b>Lecture №7.</b> Empirical and logical foundations of probability theory. The classical definition of probability	–	–
	Practical lesson	<b>Practical task №4.</b> Determining the probability of a random event by the classical definition	Homemade work	2
			WT №1	7
<b>Individual work</b>				
	Questions and tasks for self-study	Study of lecture material. Doing homework. Preparation for control work	–	–
Theme 5	<b>Classroom work</b>			
	Lecture	<b>Lecture №8.</b> Conditional probability, dependent and independent events. Full group of events. The formula of total probability. Bayesian formula	–	–
	Laboratory lesson	<b>Laboratory task №4.</b> Determining the probability of the probability formula and the Bayesian formula in MS Excel	LW №4	2
	<b>Individual work</b>			
	Questions and tasks for self-study	Study of lecture material. Preparation for laboratory work. Execution of practical tasks	–	–
Theme 6	<b>Classroom work</b>			
	Lecture	<b>Lecture №9.</b> Bernoulli's scheme. Discrete random variables, distribution law, basic characteristics	–	–
	Practical lesson	<b>Practical task №5.</b> Calculation of numerical characteristics of the distribution of a discrete random variable	Homemade work	2
	<b>Individual work</b>			
	Questions and tasks for self-study	Review of literature on the subject; doing homework using MS Excel	–	–
Theme 7	<b>Classroom work</b>			
	Lecture	<b>Lecture №8.</b> Continuous random variables. Uniform, exponential and normal distribution laws	–	–
	Laboratory lesson	<b>Laboratory task №5.</b> Determination of numerical characteristics of a continuous random variable	LW №5	2
	<b>Individual work</b>			
	Questions and tasks for self-study	Study of lecture material; performance of practical tasks. Preparation for the presentation of an independent creative task	Creative work	6
Theme 8	<b>Classroom work</b>			
	Lecture	<b>Lecture №9.</b> Selective method. Numerical characteristics of the sample	–	–
	Practical lesson	<b>Practical task №6.</b> Evaluation of numerical characteristics of random variable for the sample	Homemade work	2
WT №2			7	

	<b>Individual work</b>			
	Questions and tasks for self-study	Study of lecture material. Do your homework. Preparation for writing test	–	–
<b>Theme 9</b>	<b>Classroom work</b>			
	Lecture	<b>Lecture №10.</b> Elements of correlation-regression analysis. Correlation of qualitative indicators	Colloquium №2	8
	Laboratory lesson	<b>Laboratory task №6.</b> Research of correlation of qualitative indicators, construction of regression model	LW №6	2
	<b>Individual work</b>			
	Questions and tasks for self-study	Study of lecture material. Execution of practical tasks. Preparation for the colloquium	–	–
			Exam	40

### Recommended reading

#### Main

1. Вища математика : базовий підручник для вузів / під ред. В. С. Пономаренка. – Харків : Фоліо, 2014. – 669 с.
2. Малярець Л. М., Математика для економістів. Теорія ймовірностей та математична статистика: навчальний посібник. Ч. 3 / Л. М. Малярець, І. Л. Лебедева, Л.Д. Широкоград. – Харків : Вид. ХНЕУ, 2011. – 568 с.
3. Малярець Л. М. Практикум рішення задач по теорії вероятностей и математической статистике в MS Excel. Учебное пособие. / Л. М. Малярець, Е. Ю. Железнякова, І. Л. Лебедева – Харків : Вид. ХНЕУ, 2012. – 220 с.
4. Малярець Л. М. Теорія ймовірностей та математична статистика: навчальний посібник / Л.М. Малярець, Е.Ю. Железнякова, І.Л. Лебедева та ін. – Харків. : Вид. ХНЕУ, 2010. – 404 с.
5. Місюра Є. Ю. Теорія ймовірностей. Конспект лекцій / Є. Ю. Місюра. – Харків : Вид. ХНЕУ, 2013. – 95 с. (Англ. мов.)

#### Additional

6. Малярець Л. М. Математика для економістів : навч. посіб. / під ред. Л. М. Малярець. – Харків : Вид. ХНЕУ, 2011. – 568 с.
7. Малярець Л. М. Математика для економістів : навч. посіб. у 2-х ч. Ч. 1. / Л. М. Малярець, Л. М. Афанасьєва, А. В. Ігначкова. – Харків : Вид. ХНЕУ, 2011. – 393 с.
8. Математика для економістів: практ. посіб. до розв'язання задач економічних досліджень в MatLab / Л. М. Малярець, Є. В. Резнік, О. Г. Тижненко. – Харків : Вид. ХНЕУ, 2008. – 212 с.
9. Taboga M. Lectures on Probability Theory and Mathematical Statistics – 3rd Edition – CreateSpace Independent Publishing Platform, 2017. – 670 p.

#### Information resources on the Internet

10. Вища математика. Методичні рекомендації до самостійної роботи за темою "Диференціальні рівняння" для студентів усіх спеціальностей першого (бакалаврського) рівня / укл. А. В. Воронін, О. В. Гунько. – Харків : ХНЕУ ім. С. Кузнеця, 2018. – 75 с. [Електронний ресурс] – Режим доступу : <http://repository.hneu.edu.ua/handle/123456789/26217>

11. Вища та прикладна математика. Методичні рекомендації до практичних завдань з розділу "Вища математика" для студентів спеціальності 242 "Туризм" першого (бакалаврського) рівня / укл. Е.Ю. Железнякова, Т.В. Сілічова. – Харків : ХНЕУ ім. С. Кузнеця, 2019. – 99 с. [Електронний ресурс] – Режим доступу : <http://repository.hneu.edu.ua/handle/123456789/21049>
12. Вища та прикладна математика. Метод. рек. до практ. завдань із розд. "Теорія ймовірностей та математична статистика. Математичне програмування. Дослідження операцій" для студ. спец. 242 "Туризм" першого (бакалаврського) рівня / укл. Е. Ю. Железнякова, Т. В. Сілічова. – Харків : ХНЕУ ім. С. Кузнеця, 2020. – 98 с. [Електронний ресурс] – Режим доступу : <http://repository.hneu.edu.ua/handle/123456789/23381>
13. Железнякова Е.Ю. Теорія ймовірностей та математична статистика : методичні рекомендації до самостійної роботи з теми "Емпіричні та логічні основи теорії ймовірностей. Основні теореми теорії ймовірностей" для студентів усіх спеціальностей / Е.Ю. Железнякова, І.Л. Лебедева, С.С. Лебедев // Мультимедійне видання. – Харків, ХНЕУ ім. С. Кузнеця, 2018. [Електронний ресурс] – Режим доступу : <http://ebooks.git-elt.hneu.edu.ua/tvms>
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