MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
Lesya Ukrainka Volyn National University
Faculty of Information Technologies and Mathematics

Department of General Mathematics and
Computer Science Teaching Methods

SYLLABUS

of normative educational component

MATHEMATICS AND STATISTICS FOR AN INTERNATIONAL ECONOMIST

training of applicants of the first (bachelor) degree of higher education
Specialty 292 "International Economic Relations"
Field of Study 29 "International relations"

Educational program: "International Business"

Lutsk 2024

Syllabus of normative educational component «Mathematics and Statistics for an international economist» training of a bachelor degree of higher education specialty 292 "International Economic Relations", Field of Study 29 "International relations", Educational program: "International Business"

Developer: Khomyak Maria Yaroslavivna, PhD on Mathematics, Associate Professor, Associate Professor of the Department of General Mathematics and Computer Science Teaching Methods,

Agreed
Guarantor of the educational program:  Andriy Boyar

Approved at the meeting of the Department of General Mathematics and Methods of Teaching Informatics
Protocol No.2 dated September, 13, 2024.

Head of the Department:  Maria Khomyak

I. Description of the educational component

Table 1

<table>
<tr><th>Name</th><th>Field of knowledge, specialty, educational and professional program, educational level</th><th>Characteristic of EC</th></tr>
<tr><td rowspan="2">Full-time education</td><td rowspan="9">29 "International Relations"

292 "International Economic Relations"

"International Business"

Bachelor</td><td>Educational component of the professional training cycle</td></tr>
<tr><td>year of study: I</td></tr>
<tr><td rowspan="7">Number of hours / credits:
270 / 9</td><td>Semester: 1-, 2-th</td></tr>
<tr><td>Lectures: 62 hours</td></tr>
<tr><td>Practical (seminar): 44 hours</td></tr>
<tr><td>Laboratory tests: 26 hours</td></tr>
<tr><td>Independent work: 120 hours</td></tr>
<tr><td>Consultations: 18 hours</td></tr>
<tr><td>Form of control: credit, exam</td></tr>
<tr><td colspan="2">Language of study</td><td>English</td></tr>
</table>

II. Information about the professor

Khomyak Maria Yaroslavivna,
Academic degree: PhD in Mathematics;
Academic title: Associate professor;
Position: Associate Professor of the Department of General Mathematics and Informatics Teaching Methods
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Timetable: https://ps.vnu.edu.ua/cgi-bin/timetable.cgi

III. Description of the educational component

Abstract

The educational component "Mathematics and Statistics for an international economist" belongs to the cycle of professional training, which provides the study of the following:

- basic principles and tools of the mathematical apparatus used to solve theoretical and applied problems of business processes and international activities;
- mathematical methods of systematization, processing and application of statistical data to develop analytical models related to their further practical activities as specialists in the field of international business.

The subject of the educational component "Mathematics and Statistics for an international economist" is elements of linear and vector algebra; elements of analytical geometry; introduction to mathematical analysis, elements of differential calculus; elements of integral calculus; numerical and functional series; differential equations; basic concepts, formulas, statements of statistics.

Prerequisites

Knowledge of the basic concepts of school courses in algebra and the beginnings of analysis, geometry in the scope of the secondary school program.

Post requisites

Direct application of learning outcomes in the study of EC "Theory of International Economic Relations", "World economy and markets conjuncture", "Information technologies in international relations".

Purpose and tasks of the educational component

Providing students with basic knowledge of higher mathematics and statistics, which allow them to further master special disciplines based on mathematical concepts. Much attention is paid to the development of practical skills in solving professional problems, the ability to apply mathematical methods and statistical apparatus to study real processes and make optimal decisions.

Learning outcomes (competencies)

In the process of studying the educational component, students must develop the following competencies:

Table 2

Integral competence (IC)	The ability to solve complex specialized problems and practical problems in the field of international economic relations in general and international business in particular, as well as in the learning process, which involves the application of new theories and methods in conducting comprehensive research of world economic relations, is characterized by complexity and uncertainty.
General competences (GC)	GC 2. Ability to preserve and multiply 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 physical activity for active recreation and a healthy lifestyle. GC 3. Ability to study and be modernly trained. GC 4. Ability to plan and manage time. GC 6. Ability to communicate in foreign languages. GC 7. Skills in the use of information and communication technologies. GC 8. Ability to abstract thinking, analysis and synthesis. GC 10. Ability to communicate with representatives of other professional groups of different levels (with experts from other fields of knowledge / types of economic activity). GC 12. Knowledge and understanding of the subject area and understanding of professional activity.
Professional competences (PC)	PC2. Ability to use basic categories and the latest theories, concepts, technologies and methods in the field of international economic relations, taking into account their basic forms, to apply theoretical knowledge about the functioning and development of international economic relations. PC5. Ability to conduct a comprehensive analysis and monitoring of world markets, assess changes in the international environment and be able to adapt to them. PC6. Ability to analyze international markets for goods and services, tools and principles of international trade regulation. PC7. Ability to analyze theories and mechanisms of implementation of international monetary, financial and credit relations. PC9. Ability to diagnose the state of research in international economic relations and the world economy in an interdisciplinary combination with political, legal, natural sciences. PC11. Ability to conduct research on economic phenomena and processes in the

	international sphere, taking into account causal and spatio-temporal relationships. PC15. Ability to apply methods, rules and principles of functioning of international economic relations for the development of foreign economic activity of Ukraine. PC16. The ability to constantly improve the theoretical level of knowledge, generate and effectively use them in practice. PC20. Ability to search, critically evaluate and process information from various sources in the field of international business; generate conclusions, recommendations and proposals, new original ideas for (re) organization of business, planning and modeling of business processes and strategic (including anti-crisis) management.
Learning outcomes	Mastering the content of the discipline allows to get the following results: PLO1. Treat professional self-improvement responsibly, aware of the need for lifelong learning, show tolerance and readiness for innovative change. PLO3. Use modern information and communication technologies, general and special purpose software packages. PLO4. 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. PLO9. Understand and be able to apply, in accordance with other requirements of the educational program, modern theories and methods of solving specialized complex problems and practical problems in the field of international trade in goods and services, international capital movements, international monetary and financial and credit relations, human resources mobility, international technology transfer. PLO11. Substantiate their own opinion on the specific conditions for the implementation of forms of international economic relations at the mega-, macro-, meso- and micro-levels. PLO12. Carry out a comprehensive analysis of complex economic systems, compare and contrast their components, evaluate and justify evaluations of the effectiveness of their functioning. PLO13. 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 of international trade regulation. PLO23. Recognize the need for lifelong learning in order to maintain a high level of professional competence. PLO24. Justify the choice and apply information and analytical tools, economic and statistical methods of calculation, complex analysis techniques and methods of monitoring world markets. PLO25. Present the results of the study, on the basis of which recommendations and measures for adaptation to changes in the international environment are developed. PLO28. Use the acquired knowledge in the field of international management and marketing for independent analysis of world economic processes and making informed management decisions on this basis; analyze the specifics of the culture of international business in different countries; choose ways to enter international markets; analyze international markets and the international economic

	environment; develop measures to increase the competitiveness of the enterprise in foreign markets. PLO29. Carry out analysis and synthesis of international information; determine the information value of international databases; understand and use information that reflects the activities of international companies; to carry out competitive intelligence and other information and analytical research on a wide range of problems of international business, to communicate their results in the international business environment.

IV. The structure of the educational component

Table 3

Name of content modules and themes	Total (hours)	Lectures (hours)	Practical classes (hours)	Laboratory tests (hours)	Independent work (hours)	Consultations (hours)	* Form of control / Points
SEMESTER I							
Content module 1. Elements of Linear and Vector Algebra and Analytic Geometry							
Theme 1. Matrices and operations on them. Determinants and their properties. Inverse matrix	5	2	2	1			*OS, ST/* **4.5 points**
Theme 2. Main methods of solving systems of linear equations	11	2	2	1	5	1	*OS, ST /* **4.5 points**
Theme 3. Vectors and operations on them. Scalar, vector and triple products of vectors and their applications. Goods space, price vector.	7	2	2		3		*OS, ST /* **3 points**
Theme 4. Straight line on plane and its equations. The angle between the straight lines	12	4	4		3	1	*OS, ST /* **6 points**
Theme 5. Application of methods of analytical geometry for solving economic problems: market equilibrium model; the balance of income and loss of companies; budget sets and budget constraint lines. Second-order curves	10	2	2		5	1	*OS, ST /* **3 points**
Total for module 1	**45 hrs**	**12 hrs**	**12 hrs**	**2 hrs**	**16 hrs**	**3 hrs**	**21 points**
Module test 1							*Presentation /* **5 points** + MT/ **10 points** **Total: 15 points**

Content module 2. Introduction to mathematical analysis. The elements of Calculus							
Theme 1. Limit of a sequence. Limit of a function.	4	2	2				*OS, ST/* **3 points**
Theme 2. Derivative of the first and higher orders. Differential. Application of the derivative to the study of functions.	11	2	2	2	5		*OS, ST /* **6 points**
Theme 3. Elements of differential calculus of a function of two variables. Application of functions and derivative in economic theory.	12	2	2	2	5	1	*OS, ST /* **6 points**
Theme 4. Antiderrivative and indefinite integral. Basic methods of integrating indefinite integrals	9	2	1	2	3	1	*OS, ST /* **4.5 points**
Theme 5. Definite integral, its application. Improper integrals. Application of integration methods in economic theory.	11	2	1	2	5	1	*OS, ST/* **4.5 points**
Total for module 2	**47 hrs**	**10 hrs**	**8 hrs**	**8 hrs**	**18 hrs**	**3 hrs**	**24 points**
Module test 2							*Presentation /* **5 points** + MT/ **10 points** **Total: 15 points**
Content module 3. Differential Equations. Series							
Theme 1. Basic concepts of the theory of differential equations. First-order differential equations: with separable variables; homogeneous; linear.	15	4	2	2	6	1	*OS, ST/* **6 points**
Them 2. Differential equations in economic processes.	11	2	2	2	5		*ST/* **6 points**
Theme 3. Series.	12	4	2		5	1	*OS , ST/* **3 points**
Total for module 3	**38 hrs**	**10 hrs**	**6 hrs**	**4 hrs**	**16 hrs**	**2 hrs**	**15 points**
Module test 3							*Presentation /* **3 points** + MT/ **7 points** **Total: 10 points**
Total for semester: hours / points	**130 hrs**	**32 hrs**	**26 hrs**	**14 hrs**	**50 hrs**	**8 hrs**	**100 points**

Form of control	**credit**

SEMESTER II							
Content module 1. Organizing, grouping and representation of data							
Theme 1. Methodological principles of statistics and presentation of statistical data	18	4	2		10	2	*OS, Presentation/* **4 points**
Theme 2. Statistical methods of analysis of socio-economic phenomena and processes.	15	2	2	2	8	1	*OS, ST /* **4 points**
Theme 3. Statistical summary and grouping	16	4	2	2	7	1	*OS, ST /* **4 points**
Theme 4. Graphical Representation of Data. Statistical functions in Microsoft Excel.	16	4	2	2	7	1	*OS , ST /* **4 points**
Total for module 1	**65 hrs**	**14 hrs**	**8 hrs**	**6 hrs**	**32 hrs**	**5 hrs**	**16 points**
Module test 1							*Presentation /* **5 points** + MT/ **25 points** **Total: 30 points**
Content module II. Methods of calculation, analysis and interpretation of generalizing statistical indicators							
Theme 1. Central Tendencies and Measure of Dispersion in mass socio-economic phenomena	19	4	2	1	10	2	*OS , ST /* **5 points**
Theme 2. Sampling and estimation	16	4	2	1	8	1	*OS , ST /* **5 points**
Theme 3. Significance Tests of Hypothesis	19	4	2	2	10	1	*OS , ST /* **6 points**
Theme 4. Correlation analysis and its application in economic analysis.	21	4	4	2	10	1	*OS , ST /* **8 points**
Total for module 2	**75 hrs**	**16 hrs**	**10 hrs**	**6 hrs**	**38 hrs**	**5 hrs**	**24 points**
Module test 2							*Presentation /* **5 points** + MT/ **25 points** **Total: 30 points**
Total for semester: hours / points	**140 hrs**	**30 hrs**	**18 hrs**	**12 hrs**	**70 hrs**	**10 hrs**	**100 hrs**
Form of control	**exam**						
Total:	**270hrs**	**62 hrs**	**44 hrs**	**26 hrs**	**120 hrs**	**18 hrs**	

** Form of control: OS - oral survey, SS - self study, ST - solving tasks, MT - modular Test.*

V. Tasks for an individual work

Table 4

#	Topics	Time (hrs)
SEMESTER I		
	Application of linear algebra methods for solving economic problems: linear exchange model (international trade model); linear balance model (Leontiev model); model of equilibrium prices.	5
	Scalar and vector quantities. Concept of vector. Scalar product of vectors.	3
	The angle between two straight lines on a plane and in space. The angle between a straight line and a plane.	3
	Curves of the second order: circle, parabola. Application of analytical geometry methods for solving economic problems: market equilibrium model; the model of balance of income and losses of companies; budget sets and budget constraint lines.	5
	The application of the derivative for the studing of functions (monotonicity, extremum, the largest and smallest value of a function on an interval).	5
	Application of functions and derivatives in economic theory.	5
	The concept of the original. Table of integrals.	3
	Application of the definite integral.	5
	Application of integration methods in economic theory.	6
	Homogeneous, linear differential equations	5
	Application of the theory of differential equations in economic research.	5
Total for the 1st semester:		50
SEMESTER II		
	Normative and legal provision of statistics. International statistical organizations.	10
	Concept of statistical information. Types and methods of observation.	8
	Methodology of statistical grouping. Scheme of typological and structural grouping. Scheme of analytical and combinational grouping. Methods of secondary grouping.	10
	Classification of statistical tables. Transfer of statistical tables. Statistical graph. Classification of statistical graphs.	8
	Averages and their essence and significance in the study of mass socio-economic phenomena.	8
	Simple random sampling. Systematic (mechanical) sampling. Serial sampling. Size of a sample.	8
	Statistical hypotheses and their varieties. General procedure for testing statistical hypothesis.	8
	Economic interpretation of the correlation relation and the coefficient of determination. Economic characteristics of regression equation parameters.	10
Total for 2-nd semester:		70
Total		120

VI. Course policy

The final control in the semester 1 is in the form of a credit. The evaluation of the knowledge of the students is carried out during the current control based on the results of all seminars and modul tests. The maximum number of points for the current control is 100 points. Credit is issued and ьon the condition that the student completed all types of educational work and received at least 60 points. In case of an unsatisfactory final evaluation, or if there is a desire to increase the rating, in this case,

the points for the current assessment are canceled. The student takes a credit for the liquidation of academic debt (by writing a statement requesting to accept the credit), the maximum number of points is from 0 to 100 points. The maximum number of points for current control is 40 points in the second semester. The final control takes place in the form of an exam, for the completion of which a student can receive a maximum of 60 points. If at least 75 points are accumulated according to the results of the semester and the student agrees with this result, then the grade for the semester can be issued without taking the exam. Otherwise, the student takes the exam; the maximum number of points that can be obtained on the exam is 60 points, while the points for the final module control are canceled. The exam is held in written form. The grade for the semester in the case of passing the exam is the sum of the points of the current control and the points obtained during the exam.

The scale for evaluating the knowledge of students of educational components, 1st semester, credit (test)

Scores	Linguistic assessment
90 – 100	Credited
82 – 89	
75 – 81	
67 – 74	
60 – 66	
1 – 59	Uncredited (repassing is necessary)

A scale for evaluating the knowledge of education seekers on educational components, 2nd semester, exam

Scores	Linguistic score	ECTS score	
		grade	Explanation
90–100	Excellent	A	Outstanding performance without errors
82–89	Very good	B	Above the average standard but with minor errors
75–81	Fine	C	Generally sound work with some errors
67–74	Satisfactorily	D	Fair but with significant shortcomings
60–66	Enough	E	Performance meets the minimum criteria
1–59	Unsatisfactorily	Fx	Fail. Re-examination is required

List of credit questions
SEMESTER I

1. Definition of matrix. Types of matrices. Operations on matrices and their properties.
2. Determinant of the matrix. Basic methods of calculating determinants. Properties of determinants.
3. Basic methods of solving systems of linear equations (matrix, Kramer's and Gaussian's methods).
4. Rank of matrix. Methods of evaluating the rank of a matrix.
5. Application of linear algebra methods for solving economic problems: linear exchange

model (international trade model); linear balance model (Leontiev model); model of equilibrium prices.

6. Scalar and vector quantities. Definition of a vector. Linear operations on vectors and their properties. Space of goods, vector of prices.

7. Scalar, vector and mixed products of vectors, their properties and applications.

8. A straight line on a plane is different equations of a straight line. Angle between two straight lines. The distance from a point to a straight line.

9. A plane in space. Different equations of the plane.

10. Angle between planes. The distance from the point to the plane.

11. Straight line in a space. Different equations of a straight line.

12. Mutual location of straight lines in space. Conditions of parallelism and perpendicularity of lines.

13. Mutual placement of a straight line and a plane.

14. Curves of the second order (definition, canonical equation, basic concepts and properties).

15. Application of analytical geometry methods to solving economic problems: market equilibrium model; the model of balance of income and losses of companies; budget sets and budget constraint lines.

16. The limit of a function at a point. Geometric interpretation.

17. Continuity of a function at a point and on an interval.

18. Application of functions in economic theory: cost function, income function, profit function, cost function, function of dependence of demand for various goods on population income. Their analysis.

19. Problems that lead to the concept of a derivative. The economic content of the derivative.

20. The application of the derivative for studying of functions: monotonicity, extremum, the largest and smallest value on the interval.

21. Study of the functions of two variables at the extremum.

22. The application of the derivative in economic theory: the derivative of the production function as: marginal costs, marginal revenue, marginal revenue, marginal profit of production, elasticity of the function of one variable and partial elasticity of the function of many variables of production functions, functions of demand and supply, maximization of income and profit and minimization costs in the case of production functions of one and many variables, minimization of transport costs, optimization of enterprise taxation, supply and demand functions, equilibrium price and web-like model.

23. Basic properties of the primitive and indefinite integral.

24. Basic methods of calculating the indefinite integral.

25. The definite integral, its properties and applications.

26. Application of integration methods in economic theory: calculation of total costs, income, profit based on known relevant marginal costs, income, profit; calculation of the volume of manufactured products based on known labor productivity; calculation of additional expenses, income and profit, calculation of profit from deposit interest with continuous accrual.

27. Series and their convergence.

28.A differential equation and its solution.

29. Differential equations with separated and separable variables.

30. Application of the theory of differential equations in economic research: the Evans model (setting the equilibrium price), the growth model (growth for a constant growth rate), the growth model under competitive conditions, the dynamic Keynes model, the neoclassical growth model, the market model with predicted prices.

List of exam questions
SEMESTER II

1. Statistics as a science and a field of practical activity.
2. Subject, basic concepts and methods of statistics.
3. Normative and legal provision of statistics.
4. Organization of statistics in Ukraine and other countries. International statistical organizations.
5. The essence and organizational forms of statistical observation.
6. Types and methods of survey.
7. Grouping Data and Frequency Tables
8. Mean, Median, and Mode
9. Measures of Dispersion
10. Basic issues of statistical grouping methodology.
11. Probability Distributions and their application in grouping data and statistical study.
12. Graphical Representation of Data.
13. Data Shapes. Using Graphs to Compare Distributions
14. Sampling Terminology and Sampling Methods.
15. Representative sample and Sampling errors
16. Confidence Interval for the Mean.
17. Confidence Intervals for Proportions.
18. Confidence Interval for the Variance
19. Significance Tests of Hypothesis.
20. Type I and Type II Errors
21. Chi-Square Tests.
22. Goodness-of-Fit Test
23. Test of Independence
24. Bivariate Statistics
25. Statistical methods of correlation analysis and their application in economic analysis.

Resolution of conflict situations

Any conflict situation that arises among the participants of the educational process is resolved in accordance with the "REGULATION on the procedure and procedures for resolving conflict situations at Lesya Ukrainka Volyn National University".

The teacher's policy regarding the student

All participants in the educational process must comply with the requirements of the current legislation of Ukraine, the Statute and Rules of Internal Procedure of Lesya Ukrainka Volyn National University, generally accepted moral principles, rules of conduct and corporate culture; maintain an atmosphere of benevolence, responsibility, decency and tolerance. The atmosphere in classes should be creative, open to constructive criticism. Lateness to classes is unacceptable; using a mobile phone, tablet or other mobile devices during class; writing off Attending lectures, practical classes, consultations are mandatory.

Academic Integrity Policy

The policy, standards and procedures for compliance with academic integrity at Lesya Ukrainka Volyn National University are reflected in the Code of Academic Integrity of Lesya Ukrainka Volyn National University. The requirements for academic integrity are determined by the "Regulations on the system of prevention and detection of academic plagiarism in research activities of higher education applicants and scientific and pedagogical workers of Lesya Ukrainka Volyn National University".

Every student of education must familiarize himself with and follow the Code of Academic Integrity of Lesya Ukrainka Volyn National University, adhere to ethical principles and rules defined by law, which should be guided by participants in the educational process during training, teaching and conducting scientific activities.

Observance of academic integrity by applicants involves: independent performance of educational tasks, tasks of current and final control (for persons with special educational needs, this requirement is applied taking into account their individual needs and capabilities); references to sources of information in the case of using ideas, statements, information; compliance with copyright legislation; providing reliable information about the results of one's own educational (scientific, creative) activities.

During the evaluation of learning results, students do not use prohibited means (mobile phone, tablet, notes, educational literature, other sources of information, including Internet resources), independently perform the proposed tasks.

Deadlines and Rescheduling Policy

If the student of higher education was absent from classes for any reason, he/she has to study the theoretical material by himself using textbooks, lecture notes, performs all tasks for classroom classes, all homework.

There is a possibility to report on the completion of tasks within the deadlines set by the teacher during consultations, at the same time clarify unclear points, ask questions to the teacher. The debt from the module must be liquidated by the student before the final control from the next module begins. The deadline for liquidation of arrears from modular control is limited to the beginning of the credit and examination session.

Passing over the modular control is not allowed. Tasks that are submitted late without any reason will be assigned a lower grade.

VII. Recommended literature and Internet resources

Methodical support

1. Maria Khomyak Mathematics and statistics for economists: some guidelines on Statistics. Lutsk: Lesya Ukrainka VNU, 2022. 22 p.
2. Maria Khomyak Statistics: Course Description. Lutsk : Lesya Ukrainka VNU, 2022. 26 p.
3. Khomyak M., Mykytyuk I. MATHEMATICS: differential equations: methodological workshop on problem solving. Lutsk : Lesya Ukrainka VNU, 2024. 70 p.
4. Khomyak M., Mykytyuk I. MATHEMATICS: Integration Techniques: methodological workshop on problem solving. Lutsk : Lesya Ukrainka VNU, 2024. 90 p.
5. Khomyak M. MATHEMATICS AND STATISTICS FOR AN INTERNATIONAL ECONOMIST: modeling with functions: methodological guidelines. Lutsk : Lesya Ukrainka VNU, 2024. 40 p.
6. Khomyak M. MATHEMATICS AND STATISTICS FOR AN INTERNATIONAL ECONOMIST: some elements of Calculus: methodological instructions. Lutsk : Lesya Ukrainka VNU, 2024. 60 p.
7. Khomyak M. Analysis of data on the organization of distance learning. M*iddle east international conference on contemporary scientific studies-V*, March 27-28, 2021, Ankara, Turkey. Vol.II, P. 384-386.
8. Khomyak M. A polinomial errors-in-variables model in forecasting of economic processes. *Information society: technological, economic and technical aspects of development: coll. theses add. International of science Internet Conf.* Vol. 52. Ternopil, 2020. P. 17-19. (in Ukr.)
9. Maria Khomyak A goodness-of-fit test of a difussion model Hagia Sophia. *5th International conference on multidisciplinary scientific studies*. 2022. Istanbul, Turkey, 2022. P.85-86.
10. Yunchyk V., Fedonuyk A., Khomyak M., Yatsyuk S. Cognitive modeling of the learning process of training IT specialists (2021) CEUR Workshop Proceedings, Volume 2917, Pages 141–150, : 3 rd

International Workshop on Modern Machine Learning Technologies and Data Science, MoMLeT+DS 2021 (Scopus)
11. Pasichnyk V., Kunanets N., Yunchyk V., Khomyak M., Yatsyuk S., Muliar V., Fedonuyk A. Model of the Recommender System for the Selection of Electronic Learning Resources. CEUR Workshop Proceedings: 5 rd International Workshop on Modern Machine Learning Technologies and Data Science, MoMLeT+DS 2023, Vol. 3426, P. 344-355. (Scopus)
12. Pasichnyk V., Kunanets N., Yunchyk V., Khomyak M., Fedonuyk A., Knysh Yu. Expert assessment of educational content in IT specialists training process. MoDaST-2024: 6th International Workshop on Modern Data Science Technologies, Vol. 3723, pp. 121-132. ISSN 1613-0073. https://ceur-ws.org/Vol-3723/paper8.pdf (Scopus)
13. Pasichnyk V., Kunanets N., Yunchyk V., Khomyak M., Fedonuyk A. Project of an Educational Content Evaluation Recommender System. Proceedings of the 5th International Workshop IT Project Management (ITPM 2024), Vol. 3709, P. 192-203. ISSN 1613-0073. https://ceur-ws.org/Vol-3709/paper16.pdf (Scopus)
14. Khomyak M., Melnyk Ar. Data visualization in economic research using Power BI. *Matematyka. Informatsiini tekhnolohii. Osvita: zbirnyk tez dop. XIII mizhnar. nauk.-prakt. konf.* (m. Lutsk, 31 travn.-2 chervn. 2024.). Lutsk,. P. 74-76

Recommended Books

1. Bruce Hansen Probability and Statistics for Economists. Princeton University Press, 2022. 416 p. https://press.princeton.edu/books/hardcover/9780691235943/probability-and-statistics-for-economists#preview
2. Horkavy V. K. Statistics: Textbook. Kind. 3rd, perovl. and added Textbook. Kyiv: Alerta, 2020. 644 p. (in Ukr.)
3. Kopytko B.I., Kopych I.M. , Sorokivskyi V.M. Applied mathematical statistics for economists. Education. manual (rek. MON Ukrainy)? 2021. 404 p. (in Ukr.)
4. Monga G.S. Mathematics and Statistics for Economics. Vikas Publishing House Pvt, New Delhi. 912 p. https://www.biblio.com/book/mathematics-statistics-economics-gs-monga/d/500019018
5. Motoryn R.M., Chekotovskyi E.V. Statistics for economists: a study guide. Kyiv: Znannia, 2021. 381p. (in Ukr.)
6. Neter, Wasserman, and Whitmore. Applied Statistics, 4th Edition, Allyn and Bacon, Boston, MA.
7. Panik Michael J. Mathematical Analysis and Optimization for Economists. CRC Press, Boca Raton-London-New York, 2022. https://www.routledge.com/Mathematical-Analysis-and-Optimization-for-Economists/Panik/p/book/9780367759025

Internet resources

1. State Statistics Service of Ukraine. [Electronic resource]. URL: www.ukrstat.gov.ua
2. UN Statistical Committee. [Electronic resource]. URL: http://unstats.un.org/
3. International Institute of Statistics. [Electronic resource]. URL: http://isi.cbs.nl/
4. UN Statistical Committee. [Electronic resource]. Access mode: http://unstats.un.org/ 2.
5. International Institute of Statistics. [Electronic resource]. Access mode: http://isi.cbs.nl/.
6. Trevor Hastie, Robert Tibshirani, and Jerome Friedman.The Elements of Statistical Learning. https://hastie.su.domains/ElemStatLearn/
7. Data Science Full Course - Learn Data Science in 10 Hours | Data Science For Beginners | Edureka https://www.youtube.com/watch?v=-ETQ97mXXF0
8. Statistics - A Full University Course on Data Science Basics https://www.youtube.com/watch?v=xxpc-HPKN28