



Syllabus Course Program



Risk Analysis

Specialty

113 Applied mathematics

Educational program

Intelligent Data Analysis

Level of education

Bachelor's level

Semester

8

Institute

Educational and Scientific Institute of Computer Science and Information Technology

Department

Computer Mathematics and Data Analysis

Course type

Special (professional), Selective

Language of instruction

Ukrainian

Lecturers and course developers

**Yevgen Gomozov**

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Academic degree, academic title, position

Associate Professor, Ph.D.-M.Sc., Associate Professor of the Department of KMAD NTU "KhPI". Head of diploma projects and graduate students. Author and co-author of more than 150 scientific and scientific-methodological works. Member of Kharkiv Mathematical Society. Leading lecturer in the disciplines: "Probabilistic and fuzzy models and methods in engineering and economics", "Financial and actuarial mathematics", "Nonlinear processes and models", "Partial differential equations", "Analysis of financial risks".

[More about the lecturer on the department's website](#)

General information

Summary

The " Risk Analysis " course develops the knowledge and skills needed to make adequate decisions on the financial and stock markets in order to respond to changes in the situation and analyze data in real time.

Course objectives and goals

The " Risk Analysis " course develops the knowledge and skills needed to make adequate decisions on the financial and stock markets in order to respond to changes in the situation and analyze data in real time.

Format of classes

Lectures, laboratory classes, consultations, self-study. Final control in the form of an exam.

Competencies

ZK 1. The ability to learn and master modern knowledge.

ZK 2. Ability to apply knowledge in practical situations.

ZK 5. Ability to conduct research at the appropriate level.

ZK 6. Ability to abstract thinking, analysis, synthesis.

ZK 8. Knowledge and understanding of the subject area and understanding of professional activity.

ZK 9. Ability to learn and master modern knowledge.

SK 3. The ability to choose and apply mathematical methods for solving applied problems, modeling, analysis, design, management, forecasting, decision-making.

SK 7. The ability to solve professional tasks using computer equipment, computer networks and the Internet, in the environment of modern operating systems, using standard office applications.

SK 14. The ability to understand the statement of the task, formulated in the language of a certain subject area, to search and collect the necessary initial data.

Learning outcomes

RN 8. Combine the methods of mathematical and computer modeling with informal procedures of expert analysis to find optimal solutions.

Student workload

The total volume of the course is 120 hours (4 ECTS credits): lectures - 20 hours, laboratory classes - 20 hours, self-study - 80 hours.

Course prerequisites

To successfully complete the course, you must have knowledge and practical skills in the following disciplines: "Theory of probability and mathematical statistics", "Theory of fuzzy sets".

Features of the course, teaching and learning methods, and technologies

Lectures are conducted interactively. Project approach when performing practical classes, attention is focused on the application of information technologies in mathematical modeling of applied problems; independent study of software products related to working with numerical methods for solving partial differential equation problems, use of electronic resources. Study materials are available to students through Office 365.

Program of the course

Topics of the lectures

Topic 1. Basic concepts of decision-making in conditions of non-determinism. Probabilistic, uncertain and fuzzy modeling. Basic requirements for databases and models.

Topic 2. Classification of financial risks. Hedging

Topic 3. Construction of mathematical models of financial risks based on probability theory.

Topic 4. Bayes theorem. Examples of using Bayes theorem.

Topic 5. Construction of mathematical models of financial risks based on the theory of matrix games.

Topic 6. Construction of mathematical models of financial risks in conditions of complete uncertainty.

Topic 7. Construction of mathematical models of financial risks in conditions of uncertainty. Basic concepts of fuzzy models.

Topic 8. Fuzzy management. Performance evaluation. Key performance indicators.

Topic 9. Information technologies in fuzzy management.

Topic 10. Using the Sugeno method to solve the problem of fuzzy classification. The difference between the Sugeno method and the methods of Tsukamoto, Larsen, and Mamdani.

Topics of the workshops

Workshops within the discipline are not provided..

Topics of the laboratory classes

Topic 1. The essence and basic concepts of risk theory.

Topic 2. Methodological principles and tools for quantitative risk assessment.

Topic 3. Decision-making in conditions of risk.

Topic 4. Statistical method of quantitative risk assessment.

Topic 5. Solving a matrix game using a reduction to a linear programming problem.

Topic 6. Solving the matrix game using the iterative Brown-Robinson method.

Topic 7. Decision-making in conditions of complete uncertainty.

Topic 8 Basic operations with fuzzy sets.

Topic 9. Algorithms of fuzzy control.

Topic 10. The Sugeno method.

Self-study

Information on self-study and individual assignments (reports, course projects, etc.), if it is necessary according to the plan. Also, methods of control and assessment of self-study.

Course materials and recommended reading

Basic literature

Laktionova O. A. L 198 Management of financial risks: a study guide / Vinnytsia: DonNU named after Vasyl Stus, 2020. 256 p.

Essentials of Risk Measurement - Finance Train. URL: <http://financetrain.com>

Climate Financial Risk Forum guide 2020. Risk Management chapter. URL:

<https://www.fca.org.uk/publication/corporate/climate-financial-risk-forum-guide-2020-disclosures-chapter.pdf>

Methodical instructions for performing laboratory work in the academic discipline "Theory of Risks" / Compendium. I. A. Lysenko – Kropyvnytskyi: National Technical University, 2018.

Additional literature.

Website of the World Monetary Fund. URL: <http://www.imf.org>;

Basel Committee on Banking Supervision. URL: <http://www.bis.org>;

Site of the World Federation of Stock Exchanges. URL: <http://www.ssmc.gov.ua>;

World Bank website. URL: www.worldbank.org.

Panchenko O. I. Typology of financial risks as a basis for the organization of their insurance protection. BUSINESS INFORMATION No. 3 of 2019

Steshenko O. D. Riskology: Education. manual. – Kharkiv: UkrDUZT, 2019.

Assessment and grading

Criteria for assessment of student performance, and the final score structure

Description of the final score structure, course requirements, and necessary steps to earn points, especially paying attention to self-study and individual assignments.

Grading scale

Total points	National	ECTS
90–100	Excellent	A
82–89	Good	B
75–81	Good	C
64–74	Satisfactory	D
60–63	Satisfactory	E
35–59	Unsatisfactory (requires additional learning)	FX
1–34	Unsatisfactory (requires repetition of the course)	F

Norms of academic integrity and course policy

The student must adhere to the Code of Ethics of Academic Relations and Integrity of NTU "KhPI": to demonstrate discipline, good manners, kindness, honesty, and responsibility. Conflict situations should be openly discussed in academic groups with a lecturer, and if it is impossible to resolve the conflict, they should be brought to the attention of the Institute's management.

Regulatory and legal documents related to the implementation of the principles of academic integrity at NTU "KhPI" are available on the website: <http://blogs.kpi.kharkov.ua/v2/nv/akademichna-dobrochesnist/>

Approval

Approved by

Date, signature



Head of the department
Olena AKHIEZER

Date, signature



Guarantor of the educational
program
Olena AKHIEZER