



Syllabus Course Program



Mathematical Modeling in Management

Specialty

073 – Management

Institute

Institute of Education and Science in Economics,
Management and International Business

Educational program

Management of organizations
and administration

Department

Management (204)

Level of education

Bachelor's level

Course type

Elective

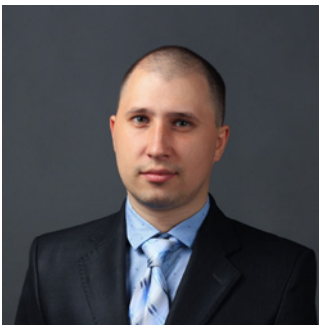
Semester

6

Language of instruction

English

Lecturers and course developers



Petro Foshchii

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Ph.D. (C.Sc.) in Economic Sciences, associate professor of Management department

Authored and co-authored over 30 scientific and methodological publications.

Courses: Econometrics, Electronic Business, Information Technology in Management, Decision-making in the IT business

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

General information

Summary

The course is aimed at obtaining by students in-depth knowledge of the methods of constructing mathematical models, applied economic problems and ways of their solution. Students will master the applied modeling and decision-making tools in management problems. The course is based on lectures and practical activities. Lectures will consist of theory exploration, examples and class discussion. Homework assignments will focus on putting the lecture material into practice.

Course objectives and goals

To form a general idea of the search, collection and analysis of information, the calculation of indicators to substantiate management decisions. Disclose management methods to ensure the effectiveness of the organization's activities. Develop students' ability to choose and use modern management tools.

Format of classes

Lectures, workshops, self-study. Individual assignment. Final control in the form of a test (Differentiated grading).

Competencies

GC03. The ability for abstract thinking, analysis, synthesis.

GC08. The ability to use information and communication technology.

SC10. The ability to assess the performed works, to ensure their quality and to motivate personnel of an organization.

Learning outcomes

LO 06. To demonstrate the skills related to search, collection, and analysis of information, calculation of indicators for substantiation of managerial decisions.

Student workload

The total volume of the course is 150 hours (5 ECTS credits): lectures - 24 hours, workshops - 12 hours, self-study - 114 hours.

Course prerequisites

To successfully complete the course, it is necessary to have knowledge and practical skills from the following courses: "Fundamentals of Management", "Economic Informatics", "Economic Statistics".

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

Lectures are delivered interactively with the use of multimedia technologies. Practical workshops use a project-based learning approach and focus on the use of information technology in management. Learning materials are available to students via OneNote Class Notebook, Google Classroom.

Program of the course

Topics of the lectures

Topic 1. Models and modeling in management.

Building a mathematical model. Stages of modeling

Topic 2. Linear optimization mathematical models in management.

Methods for solving linear programming problems. Special linear programming problems. Transportation problems.

Topic 3. Mathematical programming problems.

Nonlinear programming problems. Graphical interpretation of nonlinear programming problems solution.

Topic 4. Balance-based economic and mathematical models.

Financial mathematics elements. Compound interest and balance sheet equation of loan repayment. Economic and mathematical model of intersectoral balance.

Topic 5. Econometric models.

Paired regression analysis. Non-linear regression.

Topic 6. Decision making models in management.

Decision-making methods under conditions of risk. Decision-making methods under conditions of complete uncertainty.

Topics of the workshops

Topic 1. Model building using Microsoft Excel.

Topic 2. Linear programming problems solution using Microsoft Excel.

Topic 3. Solving nonlinear programming problems using Microsoft Excel.

Topic 4. Linear international trade model in Microsoft Excel.

Topic 5. Computer modeling using Microsoft Excel.

Topic 6. Decision-making models under conditions of risk and uncertainty using Microsoft Excel.

Topics of the laboratory classes

No laboratory classes are included in the plan.

Self-study

The course involves learning additional materials regarding the topics of the lectures. Also, the course includes performing an individual assignment in the form of calculation task and practical problem-solving related to modeling. The result is presented in a written calculation task. Students are also recommended additional materials (videos, articles) for independent study and analysis.

Course materials and recommended reading

1. Carter, M. (2001). Foundations of Mathematical Economics. London: The MIT Press.
2. Mazen, Sh. (2021). Explorations of Mathematical Models in the Management, Life, and Social Sciences with Microsoft Office Excel. John Wiley & Sons.
3. Walter, J. M. (2004). Concepts of Mathematical Modeling. Courier Corporation.
4. Stefan, H. (2011). Mathematical Modeling. Springer Science & Business Media.
5. Білоцерківський, О. Б. (2018). Математичне моделювання в економіці та менеджменті. Харків: НТУ "ХПІ".
6. Замула, О. В., & Замула, О. О. (2019). Основи роботи в Excel. Харків: НТУ "ХПІ".
7. Замула, О. В., & Замула, О. О. (2019). Робота з надбудовою Solver MS Excel. Харків: НТУ "ХПІ".

Assessment and grading

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

100% final grade is the result of the final assessment (60%) and continuous assessment (40%).

Final assessment: final test (30%); presentation of the individual assignment (30%)

Continuous assessment: mid-term test (30%); problem-solving during the workshops (10%)

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 PROKHORENKO

Date, signature

Guarantor of the educational program
Olena LINKOVA

