MATHEMATICAL MODELLING IN MANAGEMENT

COURSE SYLLABUS

Code and name of specialty	**073 – Management**	**Institute**	**Institute of Education and Science in Economics, Management and International Business**
Program name	**Management of Organizations and Administration / Business Administration**	**Department**	**Management**
Type of program	**Educational and Professional**	**Language of instruction**	**English / Ukrainian**

LECTURER

Petro Foshchii, ***petro.foshchii@khpi.edu.ua***

Ph.D. (C.Sc.) in Economic Science, associate professor of the Management department (NTU "KhPI").
Authored and co-authored over 20 scientific publications.
Teaches courses: «Econometrics», «E-Business», «Decision making in business»

GENERAL DESCRIPTION OF THE COURSE

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	● 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.
Types of classes and control	Lectures, workshops, consultations. Individual assignment (no exam).
Term	6

Student workload (credits) / Type of course	5/ Elective	**Lectures (hours)**	24	**Workshops (hours)**	12	**Self-study (hours)**	114

Program competences	GC03. The ability to abstract thinking, analysis, synthesis GC10. The ability to conduct research at an appropriate level. SC09(MOA). The ability to work in a team and to establish interpersonal interaction in solving professional tasks. SC09 (BA). The ability to generate business ideas, to justify the feasibility and forms of their implementation as well as present them to stakeholders.

Learning outcomes	**Teaching and learning methods**	**Forms of assessment (Continuous assessment CAS, final assessment FAS)**
LO 04. To show skills of identification of problems and justification of management decisions.	Interactive lectures with presentations, practical classes, problem solving, research methods, work with databases using Excel spreadsheet	Written individual assignment (FAS), practical assessment (CAS)

LO 06. To show skills of search, collecting, and analysis of information, calculation of indicators to substantiate management decisions.	Interactive lectures with presentations, practical classes, problem solving, research methods, work with databases using Excel spreadsheet	Written individual assignment (FAS), practical assessment (CAS)
LO 08. To apply management methods to ensure the effectiveness of the organization.	Interactive lectures with presentations, practical classes, problem solving, research methods, work with databases using Excel spreadsheet, teamwork	Written individual assignment (FAS), practical assessment (CAS)
LO 16. To demonstrate skills of independent work, flexible thinking, openness to new knowledge, be critical and self-critical.	Interactive lectures with presentations, practical classes, problem solving, research methods, work with databases using Excel spreadsheet	Written individual assignment (FAS), practical assessment (CAS)
LO 2.2 (MOA). Demonstrate skills to justify management decisions using information technology and systems	Interactive lectures with presentations, practical classes, problem solving, research methods, work with databases using Excel spreadsheet	Written individual assignment (FAS), practical assessment (CAS)
LO 2.3 (BA). To make calculations and to evaluate the effectiveness of real and financial investments	Interactive lectures with presentations, practical classes, problem solving, research methods, work with databases using Excel spreadsheet, teamwork	Written individual assignment (FAS), practical assessment (CAS)

ASSESSMENT AND GRADING

Ranges of points corresponding to grades

Total score (points) for all types of learning activities	ECTS grading scale	The national grading scale
90-100	A	excellent
82-89	B	good
74-81	C	
64-73	D	satisfactory
60-63	E	
35-59	FX	Unsatisfactory (with the exam retake option)
0-34	F	Unsatisfactory (with mandatory repetition of the course)

Allocation of grade points

100% Final assessment as a result of Individual assignment (40%) and Continuous assessment (60%).
40% Individual assignment: written assignment (theory + problem solving) and its oral presentation.
60% Continuous assessment: practical tasks.

Course policy	Students are required to attend classes according to schedule and adhere to ethical behavior. In case of absence, students will have to complete all tasks to compensate for missed classes. Participation in practical classes requires prior preparation and advance study of all necessary materials for productive discussions during the class. Written assignments must be submitted within the prescribed deadlines.

COURSE STRUCTURE AND CONTENT

Lecture 1	Models and modeling in management	**Workshop 1**	Building a mathematical model Model building using Microsoft Excel	**Self-study**	Reading suggested literature, making calculations. Stages of modeling
Lecture 2-3	Linear optimization mathematical models in management	**Workshop 2**	Methods for solving linear programming problems.Linear programming problems solution using Microsoft Excel		Reading suggested literature, making calculations. Transportation problems
Lecture 4-5	Special linear programming problems	**Workshop 3**	Computer modeling using Microsoft Excel		Reading suggested literature, making calculations. Graphical interpretation of nonlinear programming problems solution
Lecture 6	Mathematical programming problems	**Workshop 4**	Solving nonlinear programming problems using Microsoft Excel. Linear international trade model in Microsoft Excel. Compound interest and balance sheet equation of loan repayment		Reading suggested literature, making calculations. Economic and mathematical model of intersectoral balance
Lecture 7	Balance-based economic and mathematical models. Financial mathematics elements				
Lecture 8-9	Econometric models. Paired regression analysis, non-linear regression	**Workshop 5**	Computer modeling using Microsoft Excel.		Reading suggested literature, making calculations
Lecture 10-11	Decision making models in management	**Workshop 6**	Decision-making models under conditions of risk and uncertainty using Microsoft Excel. Building models using Microsoft Excel		Reading suggested literature, making calculations
Lecture 12	Decision-making methods under conditions of risk and under conditions of complete uncertainty				

RECOMMENDED READING

Required

1. Mazen, Sh. (2021). Explorations of Mathematical Models in the Management, Life, and Social Sciences with Microsoft Office Excel. John Wiley & Sons.
2. Kemaeva, M. V. (2017). Economic mathematical models. Nizhni Novgorod: Nizhegorodskij gosuniversitet
3. Carter, M. (2001). Foundations of Mathematical Economics. London: The MIT Press.
4. Walter, J. M. (2004). Concepts of Mathematical Modeling. Courier Corporation.
5. Stefan, H. (2011). Mathematical Modeling. Springer Science & Business Media.

Additional

1. Білоцерківський, О. Б. (2018). Математичне моделювання в економіці та менеджменті. Харків: НТУ “ХПІ”.
2. Замула, О. В., & Замула, О. О. (2019). Основи роботи в Excel. Харків: НТУ “ХПІ”.
3. Замула, О. В., & Замула, О. О. (2019). Робота з надбудовою Solver MS Excel. Харків: НТУ “ХПІ”.
4. Копич, І. М., Сороківський, В. М., & Стефаняк, В. І. (2011). Математичні моделі в менеджменті та маркетингу. Львів: Новий світ.
5. Stachurski, J. (2009) Economic Dynamics Theory and Computation. London:The MIT Press.
6. Bokil, V. A. (2009) Mathematical Modeling. London: The MIT Press.

Academic integrity

Students are expectedto adhere to the Code of Ethics of Academic Relations and Integrity of NTU “KhPI”.

The content of this syllabus is consistent with the course program.