PJSC "Higher Education Institution
"INTERREGIONAL ACADEMY OF PERSONNEL MANAGEMENT"

МАУП

SYLLABUS OF THE ACADEMIC DISCIPLINE «MATHEMATICAL MODELING IN MANAGEMENT»

Specialty: **D3 Management**

Educational level: **first (bachelor's) level**

Educational program: **Management**

MAUP 2026

General information about the academic discipline

Name of the academic discipline	**Mathematical modeling in management**
Code and name of specialty	**D3 "Management"**
Level of higher education	first (bachelor's) level of higher education
Discipline status	selective
Number of credits and hours	**3 credits / 90 hours.** Lectures: 20 Seminar classes:14 Independent work of students: 56
Terms of studying the discipline	
Language of instruction	Ukrainian
Type of final control	**test**
Discipline page on the website	

General information about the teacher. Contact information.

KHRAPATY SERGEY VIKTOROVYCH	
Academic degree	Doctor of Physical and Mathematical Sciences
Academic title	
Position	Professor of the Department of Management
Disciplines taught by the NPP	Higher mathematics Statistics Probability theory
Areas of scientific research	
Links to identifier registries for scientists	
Teacher contact information:	
Email:	
Contact phone number	
Teacher's portfolio on the website of the department / institute / academy	

Course annotation. The course is aimed at providing students with in-depth knowledge of methods for building mathematical models, applied economic problems and ways to solve them. Students will master applied tools for modeling and decision-making in management problems. The course is based on lectures and practical classes. Lectures will consist of studying theory, examples and class discussions. Homework will focus on applying the lecture material in practice.

The purpose and objectives of the discipline. To form a general idea of the search, collection and analysis of information, calculation of indicators to substantiate management decisions. To reveal management methods to ensure the effectiveness of the organization's activities. To develop in students the ability to choose and use modern management tools.

Prerequisites of the academic discipline. To successfully complete the course, you must have knowledge and practical skills from the following courses: "Fundamentals of Management", "Economic Informatics", "Economic Statistics".

Content of the academic discipline (full-time education)

No.	Topic name	Teaching methods/assessment methods
CONTENT MODULE 1. LINEAR MODELS		**Teaching methods:** verbal (educational lecture; conversation; educational discussion); inductive method; deductive method; analytical method; synthetic method; practical (working with economic models, statistical data, graphs); explanatory and illustrative; reproductive; problem-based presentation method; partially searchable; research; interactive methods (analysis of economic situations; discussions, debates; brainstorming; situational modeling; practicing modeling skills); case method (analysis of real economic situations, problem finding, proposal of solutions, construction of models); modeling of professional activities (building economic models, forecasting, scenario modeling). **Assessment methods:** oral control (oral questioning, evaluation of participation in discussions, other interactive learning methods); written control (tests, independent work, analytical tasks, essays); test control (closed-form tests: test-alternative, test-correspondence, tasks for data and model analysis); method of self-control and self-assess-
Topic 1.	Models and simulation in management.	
Topic 2.	Linear optimization mathematical models in management.	
Topic 3.	Mathematical programming problems.	
CONTENT MODULE 2. BALANCE SHEETAND ECONOMETRIC MODELS		
Topic 4.	Balance sheet economic and mathematical models.	
Topic 5.	Econometric models.	
Topic 6.	Decision-making models in management	

		ment; case study evaluation; evaluation of project and laboratory work (modeling of economic processes, forecasting).
Modular test		
Form of control: credit		

Technical facilities and/or software. The educational process uses classrooms, a library, a multimedia projector and a computer for conducting lectures and seminars with presentation elements. Studying individual topics and completing practical tasks requires access to information from the World Wide Web, which is provided by a free Wi-Fi network.

Forms of control methods.

Monitoring the progress of students is divided into current and final (semester).

Current control carried out during practical and seminar classes. Its purpose is to systematically check:

- understanding and mastering the theoretical foundations of economic processes;
- the ability to apply knowledge to build models and analyze economic data;
- skills in diagnosing and forecasting economic processes;
- using specialized software for modeling and processing statistical data.

Forms of student participation in the educational process, which are subject to current control:

- speeches and presentations on the analysis of economic processes;
- oral reports on the analysis of economic cases;
- addition, question to the person answering;
- systematic work in seminar classes and activity during discussions;
- participation in discussions, brainstorming, interactive forms of classes;
- analysis of economic data, statistical indicators, economic and mathematical models;
- written assignments (tests, tests, analytical and abstract papers);
- preparation of abstracts, theses, analytical notes;
- independent study of discipline topics and lecture materials.

Current control methods:

- oral control (survey, conversation, report, message);
- written control (test work, analytical report, essay, completion of tasks for building models or processing statistics);
- combined control (oral and written combination to assess understanding and practical skills);
- presentation of independent work or case analysis;
- monitoring activity and participation in practical classes;
- test control (closed and open tasks, analysis of graphs and models);
- working with problem situations (analytical cases, scenario modeling of economic processes).

Assessment system and requirements.
Table of points awarded to higher education students*

Topics	**Current knowledge control**	**Final control**		
		Modular	**Test****	**Total**

	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Topic 7	Topic 8	Topic 9	Topic 10	**test work**		**points**
Work in a seminar class	5	5	5	5	5	5					20	20*	100
Independent work	5	5	5	5	5	5							

*The table contains information about the maximum points for each type of academic work of a higher education applicant.

When assessing the mastery of each topic for current educational activities, the student is given grades taking into account the approved assessment criteria for the relevant discipline.

The criteria for assessing the learning outcomes of students and the distribution of points they receive are regulated by the Regulations on the Assessment of Academic Achievements of Students of Higher Education at PJSC "Higher Education Institution "MAUP".

Module control is carried out in the last lesson of the module in written form, in the form of testing.

Assessment criteria for the module test in the academic discipline " **Mathematical modeling in management** ":

When assessing a module test, the volume and correctness of the tasks are taken into account:

- the grade "excellent" (A) is given for the correct completion of all tasks (or more than 90% of all tasks);
- a grade of "good" (B) is given for completing 80% of all tasks;
- a grade of "good" (C) is given for completing 70% of all tasks;
- a grade of "satisfactory" (D) is given for the correct completion of 60% of the proposed tasks;
- the grade "satisfactory" (E) is given if more than 50% of the proposed tasks are completed correctly;
- an "unsatisfactory" (FX) grade is given if less than 50% of the tasks are completed.

Failure to appear for a module test - 0 points.

The above scores are converted into rating points as follows:

"A" - 18-20 points;
"B" - 16-17 points;
"C" - 14-15 points;
"D" - 12-13 points.
"E" - 10-11 points;
"FX" - less than 10 points.

The final semester assessment in the discipline " **Mathematical modeling in management**" is a mandatory form of assessing student learning outcomes. It is conducted within the time frame specified by the curriculum and covers the scope of material specified by the course program.

The final assessment is carried out in the form of a test. A student who has completed all the required work is allowed to take the semester assessment.

The final grade is based on the student's performance during the semester. The student's grade consists of points accumulated from the results of the current assessment and incentive points.

Students who have completed all required assignments and received a score of 60 points or higher receive a grade corresponding to the grade received without additional testing.

For students who have completed all the required tasks but received a score below 60 points, as well as for those who wish to improve their score (result), the teacher conducts a final work in the form of a test during the last scheduled lesson in the discipline in the academic semester.

Assessment of additional (individual) types of educational activities. Assessment of additional (individual) types of educational activities. Additional (individual) types of educational activities include the participation of applicants in scientific conferences, scientific circles of applicants and problem groups, preparation of publications, participation in All-Ukrainian Olympiads and competitions and International competitions, etc. in excess of the tasks established by the relevant work program of the academic discipline.

By decision of the department, students who participated in research work and performed certain types of additional (individual) educational activities may be awarded incentive (bonus) points for a specific educational component.

Assessment of independent work

The total number of points received by a student for completing independent work is one of the components of academic success in the discipline. Independent work on each topic, in accordance with the course program, is evaluated in the range from 0 to 3 points using standardized and generalized knowledge assessment criteria.

Assessment scale for independent work (individual assignments) assessment criteria.

Maximum possible assessment of independent work (individual tasks)	Execution level			
	Perfect	Good	Satisfactory	Unsatisfactory
3	3	2	1	0

Forms of assessment include: ongoing assessment of practical work; ongoing assessment of knowledge acquisition based on oral responses, reports, presentations and other forms of participation during practical (seminar) classes; individual or group projects requiring the development of practical skills and competencies (optional format); solving situational tasks; preparing summaries of independently studied topics; testing or written exams; preparing draft articles, conference abstracts and other publications; other forms that ensure comprehensive mastery of the curriculum and contribute to the gradual development of skills for effective independent professional (practical, scientific and theoretical) activity at a high level.

To assess the learning outcomes of a higher education applicant during the semester, a 100-point, national and ECTS assessment scale is used.

Final assessment scale: national and ECTS

Total points for all types of learning activities	**ECTS assessment**	**National scale assessment**	
		for exam, course project (work), practice	**for credit**
90 – 100	A	perfect	Passed
82 – 89	B	good	
75 – 81	C		
68 – 74	D	satisfactory	
60 – 67	E		
35 – 59	FX	unsatisfactory with the possibility of retaking	not accepted with the possibility of retaking
0 – 34	F	unsatisfactory with mandatory re-study of the discipline	not passed with mandatory re-study of the discipline

Course policy.

To successfully complete the course "Mathematical Modeling in Management", the student must:

- regularly attend lectures and practical classes;
- work systematically, systematically and actively in lectures and practical classes;
- make up for missed classes or unsatisfactory grades received in classes;
- to fully perform the tasks that the teacher requires to prepare, their quality is appropriate;
- perform control and other independent work;
- adhere to the norms of academic conduct and ethics.

The course "Mathematical Modeling in Management" involves mastering and adhering to the principles of ethics and academic integrity, in particular, focusing on preventing plagiarism in any of its manifestations: all works, reports, essays, abstracts and presentations must be original and author's, not overloaded with quotes, and must be accompanied by references to primary sources. Violations of academic integrity are considered to be: academic plagiarism, self-plagiarism, fabrication, falsification, copying, deception, bribery, and biased evaluation.

Recommended sources of information.

1. Bilotserkivskyi, O. B. (2018). Mathematical modeling in economics and management. Kharkiv. NTU “KhPI”.
2. Zamula, O. V., & Zamula, O. O. (2019). Basics of Excel. Kharkiv. NTU “KhPI”.
3. Zamula, O. V., & Zamula, O. O. (2019). Working with the Solver MS Excel add-in. Kharkiv. NTU “KhPI”.
4. Kopych, I. M., Sorokivskyi, V. M., & Stefanyak, V. I. (2011). Mathematical Models in Management and Marketing. Lviv. New World.
5. Stachurski, J. (2009) Economic Dynamics Theory and Computation. London. The MIT Press.
6. Mazen, Sh. (2021). Explorations of Mathematical Models in the Management, Life, and Social Sciences with Microsoft Office Excel. John Wiley & Sons.
7. Walter, JM (2004). Concepts of Mathematical Modeling. Courier Corporation.
8. Stefan, H. (2011). Mathematical Modeling. Springer Science & Business Media.